DOCUMENT RESUME

ED 188 748 PS 011 502

AUTHOR	Soekirman
TITLE	Priorities in Dealing with Nutrition Problems in Indonesia. Cornell International Nutrition Monograph Series, Number 1 (1974).
INSTITUTION	State Univ. of New York, Ithaca. Nutritional Sciences Div. at Cornell Univ.
SPONS AGENCY	Cornell Univ., Ithaca, N.Y. Center for International Studies.
PUB DATE	74
NOTE	119p.: For other monographs in this series, see ED 149 838, PS 011 294, and PS 011 502-505.
AVAILABLE FROM	Dr. Michael C. Latham, Division of Nutritional Sciences, Savage Hall, Cornell University, Ithaca, NY 14853 ($2.50: make checks payable to Cornell University)
EDRS PRICE	MF01/PC05 Plus Postage.
DESCRIPTORS	*Agricultural Production: Anemia: *Demography: Eating Habits: Females: *Food: Foreign Countries: History: Low Income Groups: *Nutrition: Nutrition Instruction: *Physical Health: Planning: Policy: Pregnancy: Preschool Children: Social Differences
IDENTIFIERS	*Indonesia

ABSTRACT

A study of the literature dealing with past and present food and nutrition problems in Indonesia reveals that the problems remain serious. The major nutrition problems are: (1) Protein-Calorie Malnutrition: (2) Vitamin A Deficiency: (3) Nutritional Anemia: and (4) Goitre. These nutrition problems afflict people of all ages, males and females. However, malnutrition is most evident in preschool children, pregnant women and low income workers. It is apparent that the underlying causes are complex, except in the case of goitre. Food production and supply per capita are inadequate and vary greatly among regions. The First Five-Year Development Plan ("Pelita-I"), 1969-1974, succeeded in increasing rice production but it neglected other food commodities, such as corn, which is an essential part of the diet of rural people in Central and East Java. Rice policy mainly benefitted the farmers of larger properties, a fact which is reflected in the farmers' food consumption patterns. Among the more than 1,000 households (from 30 villages in Indonesia) studied, 74 percent were calorie deficient and 51 percent deficient in both calories and protein. There were also substantial variations in the consumption patterns among different economic regions and classes of people with the poor being worst off. Customs regarding inequitable food distribution within families aggravate this situation. Intervention should begin with programs to alleviate goitre and vitamin A deficiency. (Author/RH)

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PRIORITIES IN DEALING WITH NUTRITION PROBLEMS IN INDONESIA

by
Soekirman

Cornell International Nutrition
Monograph Series
Number 1 (1974)

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Price: U.S. $2.50 including postage surface mail

JUN 9 1980

PREFACE

This monograph is the first in a series to be issued under the auspices of the Cornell University Program on International Nutrition and Development Policy. The Program in the Division of Nutritional Sciences is supported by the Cornell Center for International Studies. These monographs will reflect the work of students and faculty associated with the program. Our hope is that these publications will contribute to our goal which combines training, research and applied nutrition in the service of improving the nutrition, health and well-being of those who live in low income countries or communities.

The present monograph has been written by Mr. Soekirman and is based on the thesis he prepared to satisfy one of the requirements for the degree of Master of Professional Studies in International Development. Mr. Soekirman is a nutritionist with extensive Indonesian experience both in the field and in the capital; in research and in teaching; and in applied and extension activities. He has returned to Indonesia to take a leading role in the nutrition training and development plan for his country.

It has been very rewarding to have Mr. Soekirman in the Division of Nutritional Sciences at Cornell University. While he has learnt from the faculty and students here, he has also been a stimulus to all those with whom he has had contact. The thesis was written under considerable pressure of time, and with an incomplete set of Indonesian references. It speaks highly for the author's dedication that such an important and complete dissertation could have been completed under these circumstances.

I feel certain that this important monograph will be of great use to those in Indonesia working to improve the nutrition of her people. It will also be of interest to others who wish to learn about nutrition in Indonesia or whose work in other countries can benefit from the Indonesian experience.

It has been a pleasure to be associated with and to edit this work.

Michael C. Latham
Professor of International Nutrition
Director, Program on International
  Nutrition and Development Policy
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ACKNOWLEDGMENTS

This monograph has materialized because of the help of many people. First of all, the author would like to express his warm gratitude to Dr. Michael Latham, Professor of International Nutrition at Cornell University, for all of his guidance, encouragement and support in preparing this monograph.

Acknowledgment is also extended to Dr. A. G. Van Veen, retired professor of International Nutrition, and one of the founders of the Netherlands' East Indian Institute of Nutrition Research in Jakarta, Indonesia, from 1930 to 1950. His advice and critical comments on this monograph were valuable and highly appreciated.

Drs. John Mellor and Daniel Sisler, both professors of Agricultural Economics at Cornell University, are thanked for their encouraging advice. Dr. Barry Popkin, former Associate Director of Cornell's Program on International Nutrition and Development Policy, is thanked for his help.

Dr. Nevin S. Scrimshaw, Professor of Nutrition at M.I.T., Mr. Leon Miller and Dr. Samir Basta, both at the World Bank, Washington, and Dr. B. Underwood, Professor of Nutrition at Pennsylvania State University, are thanked for their support which made it possible for the author to study at Cornell and prepare this monograph.

In Indonesia, warm gratitude and appreciation are extended to Dr. Dradjat D. Prawiranegara, Director General of Medical Care, Department of Health, Dr. Darwin Karyadi, Director of the Nutrition Research Center, Bogor, and Mr. Ignatius Tarwotjo, M.Sc., Director of the Academy of Nutrition. Without their initiative, support, and permission, the author would have never been at Cornell.

Special thanks to Dr. Sajogyo, Professor of Rural Sociology, Institute of Agriculture, Bogor, for his attention in sending data from his study for use in this monograph.

Finally, the author would like to acknowledge the U. S. Agency for International Development (AID) mission in Jakarta, for providing a fellowship at Cornell, and Cornell University's Program on International Nutrition and Development Policy for making the publication of this monograph possible.

ABSTRACT

A study of the literature dealing with the past and present food and nutrition problems in Indonesia reveals that the problems are as serious as ever. The major nutrition problems are: (i) Protein-Calorie Malnutrition, (ii) Vitamin A Deficiency, (iii) Nutritional Anemia, and (iv) Goitre.

The nutrition problems afflict people of all ages, males and females. However, malnutrition is most rampant in pre-school children, pregnant women and low income workers. It is evident that the underlying causes are complex, except in the case of goitre.

On the aggregate, the food production and supply per capita are inadequate. There are great variations among regions. The First Five-Year Development Plan ("Pelita-I"), 1969-1974, succeeded in increasing rice production. However, it neglected other food commodities, such as corn, which is an essential part of the diet of rural people in Central and East Java. Rice policy benefitted mainly the bigger farmers, a fact which is reflected also in their food consumption patterns.

Among more than 1,000 households in 30 villages in Indonesia studied, 74 percent were calorie deficient and 51 percent deficient in both calories and protein. There were also substantial variations in the consumption patterns among different economic regions and classes of people. The poor are always the worst off. Maldistribution in the family aggravates the situation.

Because of the complex nature of nutrition problems, complementary measures are a conditio sine qua non for their solution. For goitre and vitamin A deficiency, however, relatively simple measures are feasible. Thus, it is suggested that programs to alleviate goitre and to some extent vitamin A deficiency should be given first priority. For the others, a National Food and Nutrition Policy and a Coordinating Board are prerequisites.

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INTRODUCTION

Indonesia in the mid 1970's is witnessing the coming of an era similar to that described by many participants at the 1971 M.I.T. Conference on Nutrition, National Development and Planning (Berg, 1973a). In contrast to the First Five-Year Development Plan ('Pelita-I'), food and nutrition problems are explicitly delineated in the 'Pelita-II' (1974/75 - 1978/79) within the context of the development process in Indonesia.

In the health education process, according to the work of Hochbaum and Rosenstock as adapted by Kar (Kar, 1968), there are three principal factors which induce people to undergo behavioral change and to adopt new habits related to better health, viz.:

(1) Psychological readiness, which, among other things, is determined by the levels of knowledge and the beliefs of the people concerning the risk of ill-health and the means of averting that risk.

(2) Existing positive group pressure to induce change.

(3) The physical conditions to facilitate the behavioral change, e.g., health services, economic situation, transportation, etc.

It is likely that these three factors have influenced the present government's attitudes which have resulted in the adoption of nutrition as a part of the overall development process in Indonesia.

Firstly, beginning in the 1950's the painstaking efforts of the Indonesian Nutrition Institute and of many nutritionists in Indonesia working in the area of nutrition education has proved to be fruitful and to yield lasting dividends. It is believed that the 'psychological readiness' concerning nutrition among the policy makers in Indonesia is, _inter alia_, the cumulative results of nutrition education and publicity concerning malnutrition.

Secondly, international 'pressure', mainly from the United Nations Agencies (WHO, FAO, UNICEF and the World Bank), has been important in encouraging governments to consider nutrition problems more seriously in their development strategies.[1] This has presumably acted as a 'positive group pressure'.

Thirdly, the economic and political conditions at present are doubtless better than ever before. Thus, the 'physical conditions' are apparently beginning to be favorable for a more serious nutrition program.

Objectives of the Monograph

This monograph is in part a study of the literature on the past and current nutrition situation in Indonesia. The objectives of the study are: (i) to review the nutrition situation in Indonesia from the pre-independence period up to the present, and (ii) to attempt to outline the priorities which should be adopted in dealing with nutrition problems in Indonesia.

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[1] For instance, see: R. McNamara, 1973, "One Hundred Countries, Two Billion People, The Dimensions of Development," Praeger Publ., Wash.

The rationales for selecting this subject are as follows:

(a) Up to now there has been no comprehensive published report concerning the nutrition problems in Indonesia.

(b) Reports on nutrition problems in Indonesia from the various international agencies were often based on limited data and short periods of observation, and were often incomplete. In addition, the approach of these agencies to the problems was basically sectoral. There seems to be a lack of consistency and continuity from one report to another, even though most of them deal with the same problem and emanate from the same international body, namely the United Nations family of agencies.1/

(c) Policy makers who have a growing interest in nutrition problems in Indonesia may be assisted by a comprehensive report on the food and nutrition problems in Indonesia. Prospects for dealing with those problems in the context of the overall development process may also be improved by the production of this monograph.

Limitations of the Monograph

The principal restriction in preparing this monograph was the limited time and data which were available. The author had to rely mostly on the data available at Cornell University; for the contemporary data, several publications and certain information were obtained directly from Indonesia by means of personal communications with several authorities in Indonesia; this was of course very limited.

It is realized that many opinions expressed in this monograph have been based on assumptions rather than on a complete statistical-data analysis. However, an endeavor had been made to at least base the presumptions on facts, knowledge and experiences of the author as a public health nutritionist.

The subjects dealt with and the opinions expressed in this monograph are often general in nature and are never comprehensive. Consequently, this preliminary work is a first step and should be followed up by more specific reports on different aspects of the nutrition problems in Indonesia. The latter are prerequisites for the development of a sound nutrition program.2/

NUTRITION ACTIVITIES IN INDONESIA:
A HISTORICAL BACKGROUND

Activities Before Independence (1888-1945)

The Netherland's East Indian Medical Laboratory: 1888-1938

The nutrition activities in Indonesia actually originate in the eighteenth century, when the problem of beri-beri was rampant. In 1886, thirty-three

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1/ e.g., MIT-WHO team to Indonesia in early 1974 (M.I.T., 1974), in their report and recommendations did not show any indication of its relationship with the previous reports from other consultants, a.o. Van Veen Report (V. Veen, 1970) and De Wijn (De Wijn, 1972).

2/ Sajogyo's report on the Evaluation of Applied Nutrition Program in Indonesia 1974 is one of the examples (Sajogyo, 1974).

percent of the illness reported at the hospitals in Indonesia was beri-beri. The victims were mainly plantation and mine laborers, prisoners and soldiers who lived in barracks (Peverelli, 1941; Flu, 1922). The colonial government of the Netherland's East Indies, through the Pekelharing Committee, established a Medical Laboratory ("Het Geneeskundig Laboratorium") on January 15, 1888 in Jakarta, then called Batavia. The principal objective was to investigate beri-beri.

In that laboratory Eijkman, the first director, later assisted by Grijns, for the first time found the clue of the relationship between the polyneuritis of poultry and polished rice. On the basis of their findings, A. G. Vorderman was instructed in 1896 to investigate the connection between the kind of rice fed to the prisoners in the Java jails and the prevalence of beri-beri. In 1899 "red rice"1/ was introduced into the prisons where formerly machine polished rice2/ had been the principal component of the diet. From this experiment, Vorderman found that before the introduction of the "red rice", three out of every 100 prisoners had beri-beri. This disease completely disappeared after "red rice" was introduced (Flu, 1922, p. 153). To dramatize this remarkable success, Mertens commented: "Before the 'red rice', a sentence of three months imprisonment was virtually equivalent to a death sentence," (Mertens, 1938). In 1929, Eijkman was awarded a Nobel Prize for his discovery, which made him one of the "forerunners" of the vitamin theory. It was therefore in Indonesia that pioneering work elucidating the cause of beri-beri and means for its prevention was performed.

The outstanding work of Eijkman and Grijns was continued by the new Chemical Division of the Medical Laboratory. In this division Jansen and Donath succeeded in 1926 to prepare crystalline vitamin B_1. Further research was required, as the preparation was later proved to be not quite pure. In 1931 Van Veen in Indonesia succeeded in obtaining crystals of "aneurin" with the strength of 500 International Units per milligram, a scientific achievement at that time which was duplicated by only one other worker, namely Peters at Oxford with vitamin B_1 from yeast (Baars, 1938; Van Veen, personal communication).

In 1919, Jansen began to investigate the dietary value of native products. With the work of Pannekoek, Van Veen, Koefoed and Postmus came the first Food Composition Table used for the Netherland's East Indies.3/ Jansen and Donath were also the first scientists to investigate the problem of goitre in Java, mainly in Wonosobo (Central Java) and Dieng Plateau (above Wonosobo) areas. In 1927 their findings led to the decision of the Head of the Opium and Salt Monopoly to supply special iodized salt for sale in the goitre regions (Baars, 1938).

1/ Undermilled or unmilled rice.

2/ For the storage purposes, white rice was commonly used in government institutions.

3/ This table was still used in Indonesia in the early 1950's. Revisions had been made on several occasions. The latest Food Table used in Indonesia was published in 1972, called "Daftar Komposisi Bahan Makanan", by Direktorat Gizi, Departemen Kesehatan, Jakarta.

Other work of Van Veen which still has important implications was his finding relating to "Djengkolic Acid", an acid isolated from "Djengkol" (Pithecolobium lobatum) which sometimes is poisonous.1/ In 1933, Van Veen and Mertens working on the problem of "bongkrek" poisoning were able to isolate an organism Bacterium cocovenans, which produces two deadly toxins called toxoflavin and "bongkrek" acid.2/

These historical events had been carried out in the Medical Laboratory building which was inaugurated as the Eijkman Institute in 1938. It is currently located at Diponegoro Street, 69, Jakarta.3/ In this building many important nutrition research activities have been completed under the auspices of the Institute of Nutrition Research. This was well known from 1934 to 1945 in Dutch as "het Instituut voor Volksvoeding", and in Indonesian (1945-1964) as "Lembaga Makanan Rakjat".

The Institute of Nutrition Research ("Het Instituut voor Volksvoeding"): 1934-1945

In 1934 a special Institute for Nutrition Research was established and attached to the Eijkman Institute. Van Veen was the first Secretary of this new institute, which had operated under the Public Health Service of the government of the Netherland's East Indies. The main tasks of this institute were: (1) nutrition research, (2) nutrition and dietary surveys, (3) an advisory body for the government concerning human nutrition problems, and (4) nutrition education (Peverelli, 1941; Van Veen, personal communication).

The interdisciplinary principle of dealing with nutrition problems was reflected in the staffing of the institute. The personnel consisted of: physicians, biochemists, agriculturists, economists, statisticians and veterinarians.

The profound achievements of this institute were in laboratory research and dietary surveys. In the period 1937 to 1942, there had been nine extensive dietary surveys; seven of which were in Java, one in South Sumatra

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1/ This bean is popular particularly among Sundanese people in West Java. Taken in excess it is toxic. Though not as serious as "bongkrek" poisoning, it can cause acute kidney disease (Van Veen, 1973).

2/ "Bongkrek" is a coconut presscake, sometimes mixed with soy bean and fermented with the mould of the Rhizopus sp. It is palatable, very cheap, has a considerable protein content, and is very popular among poor people in a certain area in Central Java. However, it is very hazardous and has caused death in a significant number of people. An Indonesian food technologist, namely Harsono Hardjohumtomo, in 1958 found a local-wild leaf "calincing" (Oxalis corniculata) which produces an acid that inhibits the growth of B. cocovenans of Van Veen and Mertens (Hardjohutomo, 1958). Unfortunately there are still some difficulties in its application. Some preventative measures through education, regulation, etc. have been taken to reduce the number of victims of "bongkrek". Van Veen's publication on these toxic foods can be found in: Toxicants Occurring Naturally in Foods, ISBN 0-309-02117-0, Nat. Acad. of Science, Wash., 1973.

3/ This building has been rebuilt. It is currently well known as the Institute of Cardiology, where an open heart surgery unit is located.

(Lampung), and one in West Ceram (East Indonesia). There were ten other smaller scale surveys, all of them in Java (Postmus, 1949).

A summary of these surveys shows that in the years 1936 to 1939 the availability of foods in Java per caput per year were: 82 kg. rice, 41 kg. corn, 151 kg. cassava root, 27 kg. sweet potatoes, 2.7 kg. peanuts, and 5.7 kg. soy beans. Total calorie and protein supply per caput per day was about 2,000 calories and 43 grams protein, mainly vegetable protein.

The inhabitants of Java were described as a small and slender type of people. The male adult of West Java had an average weight of 50.5 kg. and height of 159 cm. For females, the weight and height were 43.5 kg. and 148 cm., respectively. The average body weight in Central Java was estimated to be only 33-35 kg.

The nutrition problems found in those surveys are similar to those found today, namely vitamin A deficiency among pre-school children, "nutrition edema" which is part of the syndrome now called Protein-Calorie Malnutrition, and Goitre. Iron deficiency anemia, though it was not explicitly discussed, was believed to be as prevalent as was indicated by Toha (Toha, 1952).

The names to whom these surveys are attributed, are among others: Scheltema, Ochse, Terra, Jansen, Donath, Postmus and Van Veen (Postmus, 1949).

From the clinical and epidemiological point of view, Van Veen, Postmus and De Haas were among the groups who for the first time raised the problem of vitamin A deficiency in Indonesia in the 1930's (Van Veen, 1947). De Haas, a pediatrician at the Central Hospital during this period, is probably also the first investigator of Protein-Calorie Malnutrition in Indonesia in 1935 (Hin, 1958).

Activities Since Independence: 1945-1973

Health Conditions in the Early 1950's

From 1940 to 1950, during the Second World War, the Japanese occupation and the later revolution in Indonesia, very little could be done in the field of public health and nutrition in Indonesia. Though independence was proclaimed in 1945, it was not until 1950 that public health and nutrition activities could start operating in any significant manner.

In the early days of independence, the health conditions in Indonesia were probably among the worst in the world. The infant and maternal death rates were higher than in many other countries, viz. 115-300 and 2-16 per thousand, respectively. In other words, "every quarter of an hour, a woman dies in childbirth, while every minute a baby dies," (Toha, 1952; Leimena, 1953). More than 60 percent of the total deaths were attributed to the death of children under five years of age (Poesponegoro, 1953). There was only one medical doctor for every 60,000 people, and only eight hospital beds available for every 10,000 people (Table 1).

Table 1. SOME HEALTH INDICES OF INDONESIA IN THE EARLY 1950's IN COMPARISON WITH OTHER COUNTRIES

Countries	Year	Rates	Sources
Infant Mortality:			
Indonesia	1952	115-300/1000	Poesponegoro, 1953
India	1942	162.6	ibid.
Ceylon	1948	92.0	ibid.
Thailand	1947	152.0	Williams, 1966
Colombia	1950-1952	120.0	Bengoa, 1973, p. 111
Mexico	1950-1952	95.0	ibid.
U.S.A.	1948	31.8	Leimena, 1952
Netherlands	1948	21.0	ibid.
Maternal Death:			
Indonesia	1952	12-16/1000	Leimena, 1952
India	1939	12	ibid.
U.S.A.	1948	1.1	ibid.
Medical Doctor Ratio:			
Indonesia	1952	1 : 60.000	Leimena, 1952
India	1952	1 : 6.300	ibid.
Japan	1952	1 : 1.200	ibid.
England	1952	1 : 1.000	ibid.
Netherlands	1952	1 : 1.500	ibid.
International	1952	1 : 1.000	ibid.
Available Beds at the Hospitals:			
Indonesia	1952	0.80 : 1.000	Leimena, 1952
India	1952	0.24 : 1.000	ibid.
U.S.A.	1952	10.40 : 1.000	ibid.
Netherlands	1952	4.20 : 1.000	ibid.

It is interesting to note, that at the time, Toha and Soedjono, then prominent and authorative obstetricians and pediatricians, respectively, had stated that malnutrition was the principal cause of the high infant and maternal death rates (Toha, 1952; Poesponegoro, 1953).

Among the eleven programs of the Ministry of Health in the 1950's, one was on nutrition. This program was carried out by the Institute of Nutrition ("Lembaga Makanan Rakyat") until the mid 1960's, with Poorwo Soedarmo as the first director. From 1964 up to now this institute has been a division[1] of the Department of Health.

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[1] Currently headed by Soedarso.

The Indonesian Institute of Nutrition: 1950-

In contrast to the old Nutrition Institute, which concentrated its activities on research, the present Indonesian Nutrition Institute has as its primary goal the application and development of the science of nutrition for the benefit of people. The first program which was begun was nutrition training and education, at the same time as undertaking research and nutrition surveys. It should be noted that during the 1950's, the government had already adopted a "Food and Nutrition Policy" though this was later found to be ineffective (Leimena, 1956; Soedarmo, 1958).

In carrying out these programs, the interdisciplinary principle of the old institute has been maintained. This principle had always been stressed by Poorwo Soedarmo.

Nutrition Training Program

When the old Institute of Nutrition became controlled by the Indonesian Government in 1950, there were practically no skilled personnel to carry out the programs. One result was that a School for Dietetics was established in 1951. Since 1953 this school has been upgraded to become an Academy of Nutrition,[1] a college giving a Bachelor's degree in nutrition.

A total of 325 nutritionists (males and females) had graduated from this academy by 1973. Approximately 70 percent of them are still actively working either as dietitians or public health nutritionists. Thirty-seven of them have graduate degrees from one of the universities in Indonesia or from abroad (Table 2).

Table 2. NUTRITION PERSONNEL IN INDONESIA, 1950-1973

Year	Medical Nutritionist[a]	Nutritionist[b]			Assistant Nutritionist[c]
		Ph.D.	M.S.	B.S.	
1952	2	0	0	0	0
1963	12	1	3	158	± 200
1973	28	1	36	325	433

a/ Medical Nutritionist = MD + 3-4 years assistantship at the nutrition division, Medical School University of Indonesia, Jakarta. Or MD + diploma SEAMEO--graduate course on nutrition.

b/ B.S. = the graduates of the Academy of Nutrition, Jakarta. M.S. = B.S. + graduate training in Indonesia or abroad, mostly in the field of public health, agriculture, administration, nutrition and dietetics.

c/ The graduates from the School of Assistant Nutritionist, with senior-high school diploma in nutrition.

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[1] Since 1966, the present author has been a lecturer and staff member of this academy. The first director of the academy was Poorwo Soedarmo, followed by Ignatius Tarwotjo who has been director since 1965.

In addition, a School for Assistant Nutritionists, equivalent to a senior high-school level, was also established in 1952. More than 400 graduates have been working as junior dietitians or nutritionists in various hospitals and health centers in the country.

In 1955, nutrition was included in the curriculum of the medical school at the University of Indonesia, Jakarta.[1] In 1960, a nutrition division of this school was created.[2] There are 28 medical nutritionists graduated from this division. They are mostly in charge of developing nutrition curricula in other medical schools in the country. By 1973, eight out of 11 government medical schools had included nutrition in their curricula.

Another milestone worth mentioning in the field of personnel training was the establishment in 1970 of the Postgraduate course on Applied Nutrition[3] for South East Asian Countries which is under the auspices of the South East Asia Ministry of Education Organization (SEAMEO). A ten month course is offered at the SEAMEO nutrition center at the University of Indonesia. Fifteen to 20 students from the SEAMEO countries enroll in this course yearly.

It should be mentioned that since 1965 the Graduate School of Home Economics in Jakarta has also graduated students majoring in nutrition. Most of them are employed by the Department of Education as nutrition educators in public schools.

Nutrition Education

Although it was not always well planned, nutrition education has been carried out in almost every major part of Indonesia. It has been conducted by most of the nutritionists, especially those who have to work in the regional health departments, where there are usually no resources to start a definite nutrition program. These resources must be sought with painstaking endeavor. Nutrition education is a tool with which to start. The local newspapers, magazines, and radio which are usually available in all major cities in Indonesia are effective mass media for nutrition education at least for the urban dwellers and policy makers.[4]

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[1] To facilitate this training, the first Nutrition Division in 1960 was also established at the General Hospital in Jakarta, which is also a teaching hospital for the above medical school. This division, headed by Sunita Almatsier, has been recognized as one of the principal divisions with the same level as other professional divisions.

[2] The first chairman was Poorwo Soedarmo and then Soemilah Sastroamidjojo.

[3] With Dradjat D. Prawiranegara as the director, and Djaeni Sediautama as the Executive Director.

[4] When the present author was assigned to initiate nutrition programs in Aceh province (northern Sumatra) in 1961, it took two years to persuade the local government to allocate a very small budget for nutrition programs as a part of other public health programs. During those two years, he devoted most of his time to "selling" nutrition through these media. He found it was effective and cost very little. The same method has been used by many nutritionists in Indonesia.

A popular slogan for the purpose of nutrition education is well known: "Empat Sehat Lima Sempurna" (Four is Health, Five is Perfection).[1] This slogan was created by the Nutrition Institute in 1952.

The Applied Nutrition Program (ANP) is the only government program with comparatively better planned nutrition education activities. The significance of this program is believed to be in creating favorable attitudes among the local policy makers concerning nutrition problems (De Wijn, 1972; M.I.T., 1974). The present author believes that it is not only the ANP's nutrition education that has had positive effects; as mentioned at the introduction of this monograph the current "nutrition boom" in Indonesia may not have emerged had there been no nutrition education activities in the past.

Food and Nutrition Policy

If at the end of this monograph there is a suggestion that the Indonesian government should establish a national nutrition coordinating board, it should be noted that such a board did exist in the 1950's. In 1952 this board was called the "National Food Improvement Committee" ("Panitia-Negara Perbaikan Makanan") and then it was promoted to a higher level in 1958 as the "National Food Board" ("Dewan Bahan Makanan"). Leimena,[2] Poorwo Soedarmo[3] and later on Dradjat Prawiranegara[4] were the principal promoters of these boards (Leimena, 1956; Soedarmo, 1958; Prawiranegara, 1962).

The food policy with which they dealt was mainly related to rice problems. A national recommended food allowance, then well known as the "basic menu" ("menu pedoman"), was formulated in 1963 for the food production policy. However, the implementation of those policies was practically nil. Because of political reasons and rapid inflation the board and its policies (as did many other government activities) lost their significance.

An interesting episode in nutrition occurred in 1964, when the country suffered from an acute rice shortage. A mass nutrition campaign called "Nutrition Illiteracy Operation" ("Operasi Buta Gizi") was launched throughout the country as the implementation of one of the late president Soekarno's speeches. The main objective was to promote the production and consumption of corn as a rice substitute (Prawiranegara, 1964). The campaign did succeed in increasing corn production (see section on production). No data are available relating to the extent to which this campaign affected food habits and nutrition.

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[1] Four refers to: 1. Calorie foods (rice, corn, etc.); 2. Protein sources; 3. Vegetables; and 4. Fruits. Five is perfection, refers to the role of milk in making the above four foods nutritionally perfect.

[2] Then was a Minister of Health and later on became the third Prime Minister of the Indonesian Government. Currently retired.

[3] Then was the director of the Nutrition Institute and founder of the nutrition activities in Indonesia, since the independence period. Currently Professor (retired) of Nutrition, University of Indonesia.

[4] Poorwo Soedarmo's successor. Currently Professor of Nutrition at the University of Indonesia and Director General of Medical Care, Department of Health.

An abortive communist coup d'etat in 1965 brought the country to a new political and economic situation. The first serious Five-Year Development Plan ("Pelita-I") was implemented in 1969-1974. The food production policy in this plan was based, among other things, on the Recommended Dietary Allowances formulated by a Workshop on Food in 1968 in Jakarta, under the auspices of the Indonesian Scientific Institute and United States Academy of Sciences (NAS-LIPI, 1968).

Nutrition Research and Surveys

Until the early 1960's, some of the principal investigators in nutrition research in Indonesia were WHO or FAO consultants. Among them were Oomen in 1952-1953 with his kwashiorkor and xerophthalmia studies; Klerk with his height and weight studies among school children (Klerk, 1956); and Bailey who became well known for his rural nutrition studies, carried out mainly in Gunung Kidul in 1957-1958 (Bailey, 1961; Bailey, 1962). Other consultants who have made contributions to nutrition research in Indonesia are El Rawi, Blankhart, Gyorgy, Rose, Roels and Reh (Leung, 1972; Hermana, 1971).

At the beginning of 1960 some Indonesian nutritionists with various fields of interest started laboratory and field nutrition surveys. Since 1965, most of the nutrition research has been centralized at the Bogor Nutrition Research Centre, with Darwin Karyadi as the director. The animal experiments have been carried out at the "Diponegoro Unit Laboratory",1/ Jakarta, under the auspices of Lie Goan Hong and Oei Kam Nio. Other laboratory work on a smaller scale has also been undertaken at the Academy of Nutrition and the Nutrition Division of the Medical School, both in Jakarta. The major part of this monograph is a review of the nutrition research and surveys undertaken in Indonesia.

NUTRITION PROBLEMS IN INDONESIA: ITS NATURE AND EXTENT

As stated in the first section, the major nutrition problems in Indonesia are: (1) protein-calorie malnutrition, (2) vitamin A deficiency, (3) nutritional anemia, and (4) endemic goitre (Direktorat Gizi, 1973).

In this section, the nature and extent of each problem will be reviewed. In order to understand the factors underlying the problems, the epidemiological characteristics as well as the public health aspects will be briefly discussed.

Protein-Calorie Malnutrition (PCM)

This terminology refers to the health insults, in adults and most often in pre-school children, which are the outcome of insufficient intakes of protein and calories by the individual. These insults most commonly result in growth failure which is most frequently assessed by comparison of a child's height and weight with certain standards. Whereas limited growth failure may be a mild manifestation, it can become severe and it may be a prelude to a

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1/ Currently attached to the SEAMEO Nutrition Centre, University of Indonesia.

number of serious diseases of syndromes of PCM notably kwashiorkor, nutritional marasmus and marasmic kwashiorkor, all of which have a high fatality rate. Prolonged PCM may lead to nutritional dwarfing. The nature of the problem is nearly always complex (Table 3) (Bengoa, 1973a).

Kwashiorkor and marasmus are the acute stages of PCM. Since these severe stages usually have a relatively short duration before recovery or death occurs, the number of cases seen in the community at a given moment is usually relatively small. Moderate PCM and nutritional dwarfing in children are far more prevalent but are often not recognized as a deviation of health; in Indonesia these children are known in the pediatric term as "not sick but not healthy" (Soedarmo, 1958; Sutedjo, 1968).

Table 3. SIMPLIFIED CLASSIFICATION OF PCM

Categories	Body Weight as a Percent of Standard	Body Weight	Edema	Deficit of Weight for Height
Kwashiorkor	80-60	Affected	+	++
Marasmus	less than 60	Affected	0	++
Marasmic kwashiorkor	less than 60	Affected	+	++
Moderate PCM	80-60	Affected	0	Minimal
Nutritional dwarfing	less than 60	Pronounced deficit	0	Minimal

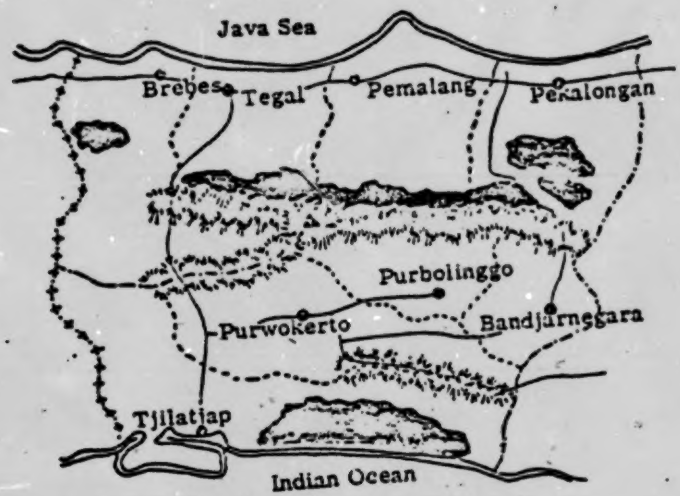
In adults, the manifestation of PCM is well known as "hunger or nutritional edema" (Bailey, 1961a) which had been rampant in certain areas of Java, Madura and later on also in the Lombok islands until the 1960's. In Gunung Kidul (Central Java) and Madura, Bailey in 1960 found that 40-55 percent of the lactating women had "hunger edema" (Bailey, 1962a). In males the incidence was 4-18 percent in Gunung Kidul (Bailey, 1961c). This problem is endemic mainly in cassava-eating regions. An outbreak in those with a rice or rice-corn based diet is usually the aftermath of a disaster such as flood or drought. In Central Java, the situation was worst in the 1960's in comparison to the 1930's, as shown in the "hunger edema map" compiled by Gambiro (Figure 1, Appendix 1 and 2) (Sudirdjo, 1968).

A lack of calories and to a less extent of protein in the diet may in adults limit energy or work output; may reduce the body's capacity to resist infection; and may cause loss of fat deposits and wasting of muscles.

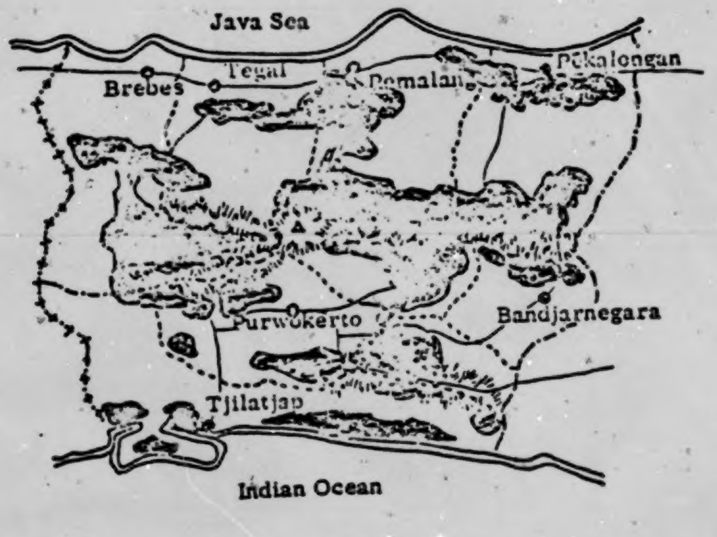
Although the crop failures etc. may lead to overt "hunger edema", the cardinal cause of this condition is poverty (Bailey, 1962b; Napitupulu, 1959). In turn, poverty in Indonesia--particularly in Java--is a phenomenon

Figure 1. THE GEOGRAPHY OF HUNGER OEDEMA
IN PEKALONGAN AND BANYUMAS RESIDENCIES
CENTRAL JAVA IN 1930-1940 and 1961-1962

1930 - 1940


Java Sea
Brebes
Tegal
Pemalang
Pekalongan
Purbolinggo
Purwokerto
Bandjarnegara
Tjilatjap
Indian Ocean

1961 - 1962


Java Sea
Tegal
Pemalang
Pekalongan
Brebes
Purwokerto
Bandjarnegara
Tjilatjap
Indian Ocean

REPRODUCED FROM: Sudirdjo, R.G.P., (1968), "A Socio-Hygienic Survey, Pemalang Regency, Central Java". Thesis, Leiden.

of population pressure which has always threatened the island of Java and which existed before the war. This was described by Postmus and Van Veen (Postmus, 1949) and very recently by Penny (Penny, 1973) (Table 4).

Table 4. POPULATION DENSITY, BY REGION, INDONESIA
1930, 1961, 1971

Region	Area (1,000 sq. km.)	Population (millions)			Density (per sq. km.)		
		1930	1961	1971	1930	1961	1971
West Java[a]	48.6	11.4	20.5	26.3	235	422	541
Central Java	34.5	13.7	18.4	21.8	397	533	634[b]
Jogyakarta	3.1	1.6	2.2	2.5	516	710	793
East Java	47.4	15.1	21.8	25.5	318	460	539
Java + Madura	134.7	41.7	62.9	76.1	309	467	565
Sumatra	541.2	8.3	15.7	20.8	15	29	38
Kalimantan	550.8	2.2	4.1	5.1	4	7	9
Sulawesi	227.6	4.2	7.1	8.5	18	31	37
Bali	5.6	1.1	1.8	2.2	196	321	377
Maluku + Irian Jaya	496.4	0.7	1.6	2.1	1	3	4
Indonesia	2,027.1	60.6	97.0	119.2	30	48	59

[a] Included Jakarta Raya, which had population density of 7,944 in 1971.

[b] In rural area of Central Java, in 1972 Penny found the density of 1,300-1,700 persons per square kilometer of all land and arable land (Penny, 1973).

Source: Central Bureau Statistic, 1971, "Statistical Pocket Book, 1970/1971," Jakarta.

At the present time, overt "hunger edema" is rarely seen as a major problem. However, the signs of mild PCM associated with anemia, especially in women, are still encountered in certain areas of West and Central Java, where "hunger edema" used to be endemic (Martoatmodjo, 1973; Sastroamidjojo, 1973).

In contrast to "hunger edema" which is easily recognizable and attracts much concern, PCM in pre-school children has not always been seriously taken into consideration. In Indonesia, PCM in pre-school children was first drawn to the attention of the medical profession by Oomen in 1953. His studies on clinical as well as epidemiological features of PCM in Jakarta in 1953 (Oomen, 1953) had been followed by several other studies in West Kalimantan (Hoogenkamp, 1956), Jakarta (Hin, 1958), Bogor (Blankhart, 1967) and Jogyakarta (Timmer, 1965).

The prevalence of PCM recorded in the 1950's using the Gomez classification revealed in children 0-5 years of age a rate of 2-5 percent for severe PCM and 7-44 percent for mild or moderate PCM. Oomen describing the prevalence of PCM in the hospital in 1954 wrote:

> "...The patients under review are neither exception nor rarities. The 124 cases were seen within 10 weeks in the outpatient department in Jakarta Central Hospital. A dozen or more may be encountered there every day" (Oomen, 1955).

The situation seems unlikely to show any improvement for some time. A morbidity survey in children conducted by the Department of Child Health, Central Hospital, Jakarta, in 1966-1967 indicated that PCM is the second most important pediatric problem after respiratory infections. Of 118,631 children aged 0-12 years examined at the outpatient clinic, 29.6 percent were found to be malnourished as judged by their body weight in relation to their age. Only 1.64 percent of them showed severe PCM. Most of the PCM children were 1-5 years of age. These figures are believed to be similar to what would be found in other large cities in Indonesia. Sutedjo stated that "one third of the urban child population live in a condition of mild PCM" (Sutedjo, 1968).

It is believed that PCM is equally prevalent in the villages because of the high population density and the relatively poorer sanitary facilities in both rural areas and the squatter slums around the cities. Evidence indicates that in 30 villages studied in 1973 in Java, Bali, West Nusatenggara, North and South Sumatra, 27 and 5 percent of the children of 0-5 years had moderate and severe PCM, respectively (Sajogya, 1974).

The validity of extrapolating these figures for comparison with other areas is not clear because the criteria for defining the degree of PCM is sometimes not well defined and because there are local and regional differences. However, considering that general living conditions of the majority of the people is still very low,[1] these data are unlikely to be far from the reality. Table 5 indicates that the figures for Indonesia are similar to those from other Asian countries compiled by Bengoa.

The Epidemiology of PCM

When considering PCM, the term "epidemiology" recognizes the interaction between the child as the host, the food the child eats as the agent, and the surroundings where the child lives as the environment. Epidemiological investigation involves the questions of "what variables are involved in each of the three components and how these variables interact to produce PCM." The strength of each variable and the degree of intervention is also important. An attempt to answer these questions has been attempted by complex studies in India and the Philippines, using multiple-regression analysis.[2]

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[1] For an exercise which tries to correlate various indicators of living conditions and malnutrition, see Monckeberg, "Factors Conditioning Malnutrition in Latin America" (Monckeberg, 1970).

[2] In India is the Tamil Nadu Systems Study, a.o. to identify the determinants of diet of children and pregnant women (Berg, 1972). In the Philippines, the study has been concentrating on the vitamin A deficiency problems (Popkin, 1974).

Table 5. THE PREVALENCE OF PCM IN CHILDREN 0-5 YEARS, USING GOMEZ CLASSIFICATION

Region/Country	Year	n	Moderate PCM (percent)	Severe PCM (percent)	Note
Indonesia:					
Jakarta (1)	1953	415	7.3	2.7	squatter area
Bogor (2)	1959	110	44.0	3.6	squatter area
Jakarta (3)	1967	118,631	29.6	1.6	hospital
North Sumatra (4)	1972	103	22.0	2.0	villages
8 Provinces (5)	1973	699	27.0a/	4.8a/	30 villages
Philippines (6)	1972	57,703	?	3.86	hospital
Asia (7)	1966-69	?	16-43.1	1.4-2.9	from 4 countries
Latin America (7)	1966-69	?	4.4-32.0	0.5-4.1	from 12 countries
Africa (7)	1966-69	?	5.6-27.2	0.5-7.6	from 8 countries

a/ Originally severe PCM was classified as moderate and severe (body weight less than 80%), for moderate was classified as mild (weight 80-85%).

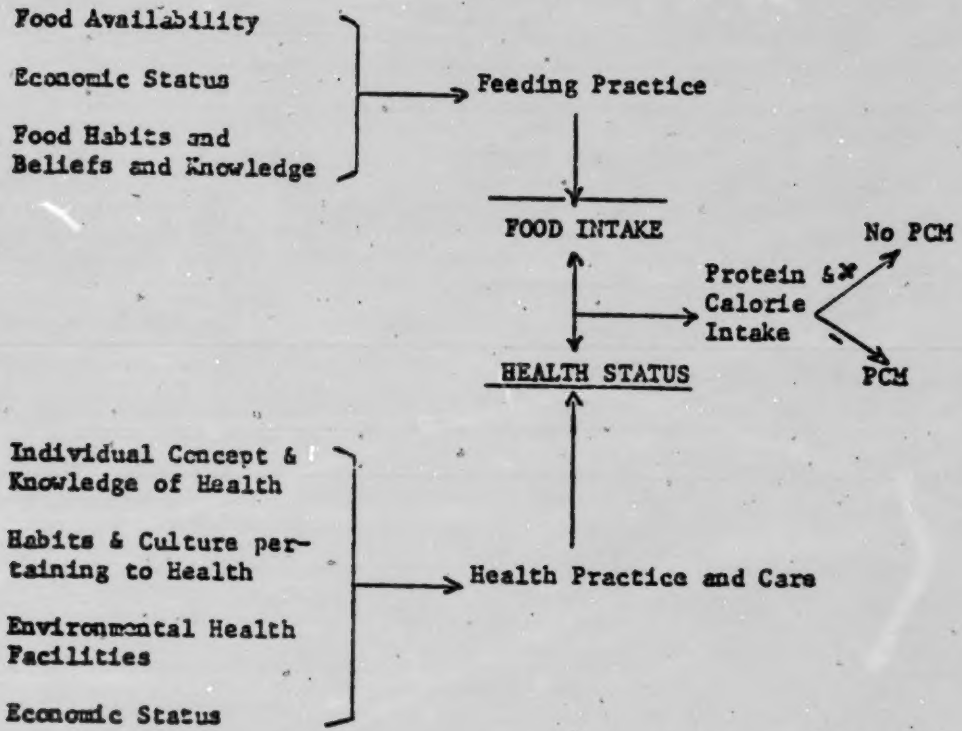
Source: (1) Oomen, 1953; (2) Blankhart, 1967; (3) Sutedjo, 1968, note the age of children here is 0-12 years. Most of the PCM at 1-5 years; (4) De Wijn, 1972; (5) Sayogya, 1974; (6) Ubaldo, 1973; (7) Bengoa, 1973.

There have been a number of publications which described the complex interaction among factors contributing to PCM. For example, the ecological approach of Williams and Cravioto (Williams, 1962; Cravioto, 1973) provides a good outline of the biological, socio-cultural, and economic factors involved in PCM (Appendix 3). A somewhat simplified model still demonstrating the complexity of the problem has also been developed by King (King, 1966).

From the planning point of view, the more simplified model is probably more useful. The concept of Call and Levinson using determinants is considered appropriate to the objective of this monograph (Call, 1973). The following diagram (Figure 2) is modified from this concept.

As defined, PCM is a direct manifestation of inadequate intake of calories and proteins. This in turn is a result of the interaction process of food ingested (food intake) and the health status of the children. A healthy child will utilize most of the food he eats. A child with infections, such as diarrhea and measles, is not able to utilize all his food effectively.

Figure 2. CONCEPTIONAL DETERMINANT OF PCM, ADAPTED FROM CALL AND LEVINSON (CALL, 1973)


Food Availability
Economic Status
Food Habits and Beliefs and Knowledge
Feeding Practice
FOOD INTAKE
HEALTH STATUS
Protein & Calorie Intake
No PCM
PCM
Individual Concept & Knowledge of Health
Habits & Culture pertaining to Health
Environmental Health Facilities
Economic Status
Health Practice and Care

Infections cause increased nitrogen loss and may increase the nutrient requirement, mainly protein, and it interferes with the digestion and absorption process of the food in the body. In addition, infections may cause anorexia--which decreases the ingestion of food. Thus, infections may have adverse effects on nutritional status (Scrimshaw, 1966).

In contrast, a healthy child may eventually develop PCM simply because of an insufficient food intake and/or because the quality of the diet is poor. PCM due to simply food of poor quality or quantity may be referred to as Primary Malnutrition and that which is conditioned by an infection may be termed Secondary Malnutrition. Usually the two are combined (McLaren, 1972).

It should be stressed that factors conditioning PCM are very complex. They include low income per capita; illiteracy; various cultural factors; poor sanitary conditions; and perhaps lower intellectual performance of less privileged groups (Monckeberg, 1970).

Public Health Significance of PCM

a. The Effects on Mortality

Mortality rates are a significant indicator of the health status of a people. The mortality rates for pre-school children reflect very well the nutrition condition of that group (Monckeberg, 1970). Many papers have been published dealing with this matter.[1] In Latin America, 8 percent of the deaths in children 6 months to 2 years have malnutrition as an underlying or main cause of death, and 41 percent as an associated cause (Bengoa, 1973a). It is believed that in many other developing countries a more or less similar situation exists.

In Indonesia, the primary cause of death in infants and children is diarrhea due to malnutrition and various gastro-intestinal infections (Satjadibrata, 1964; Repelita-II, 1974). As mentioned above, PCM has been considered as the second pediatric problem in Jakarta. As diarrhea and PCM usually go hand in hand (Gordon, 1963), there is no doubt that PCM contributes more than any other factor to the high mortality rate in infants and children in Indonesia.

There is evidence that progress in public health activities in Indonesia has been accomplished in the past decades. The overall infant mortality has dropped from the pre-independence figure of more than 250 to 110-150 per thousand in the 1970's (Repelita-II, 1974). In Jakarta the figure was 97 per thousand in 1968 (Sutedjo, 1968). A similar trend has been observed in many other developing countries. However, it should be kept in mind that this decline can be attributed more to the specific public health programs aimed at reducing mortality rather than to any improvement of living standards or of general nutrition conditions in the country (Bengoa, 1973a).

In this context it is interesting to note the question raised by Sutedjo in an international pediatric conference in Australia in 1968. He questioned:

> "Could mortality rate be lowered to the level of developed countries by establishing sanitary measures and immunizations, leaving the nutrition situation as bad as ever?" (Sutedjo, 1968).

A longitudinal study carried out by Sulianti Saroso *et al*. at Pondok-Pinang, a semi-rural village near Jakarta, can partly answer the above question. In that village, 961 families of low economic class with 888 children under 5 years of age were studied for 5 years in 1960-1966. Very intensive health care and services were provided for these families; however, neither health education nor nutrition programs were undertaken. During the study period, 168 infants were born, giving a birth rate of 33.9 per thousand.

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[1] Among others: C. D. Williams, 1966, "Malnutrition and Mortality in the Pre-School Children," National Academy of Sciences, National Research Council, Wash.; and J. M. Bengoa, 1971, "Nutritional Significance of Mortality Statistics," Proc. Western Hem. Nutr. Congress III.

Crude death rates were 9.7 per thousand. Twenty-four or 51 percent of the total recorded deaths were in children under 5 years of age. It is surprising that the infant mortality rate was so remarkably low, viz. 39 per thousand (Saroso, 1972).

Though the reliability of the data has been disputed this study suggests that provision of intensive health care and services may have an affect on general morbidity and mortality. Nutritional deficiencies, however, seemed not to have been influenced by the presence of health personnel who were instructed to do nothing relating to education and nutrition.

b. The Effects on Physical and Intellectual Development

Latham, in one of his papers, stated that:

> "Preventing death from malnutrition and from infections is not a final goal. Regard should be taken also of the children who survive these insults of malnutrition and frequent severe infections. The fact that the majority of the children in developing countries became malnourished in early life and survive means that a large proportion of school children and adults are not those who have escaped malnutrition, but who are survivors of the previous generation of malnourished children" (Latham, 1969).

The impact of PCM on physical development such as dwarfing has for long been known. It was only later that the scientific work proved that PCM is related also to intellectual development. Many publications have been devoted to this subject.[1] Although further research is still needed, it is widely agreed that PCM in early childhood is associated with intellectual backwardness in later life.

In Indonesia, a group of healthy and malnourished children examined by Blankhart in 1958 were reexamined in 1964 by Darwin Karyadi et al. It was found that malnourished children had significantly lower IQ than healthy children. The study indicated that PCM during the first and third year of life or possibly earlier, was associated with a retardation of both physical and intellectual development (Giok, 1967; Liang, 1967).

Vitamin A Deficiency

The second major nutrition problem results from a prolonged deficiency of vitamin A. The clinical term commonly used for the resulting condition is xerophthalmia. Vitamin A deficiency is a broader terminology; it is defined as:

> "the presence of depleted tissue stores and low blood levels of vitamin A resulting from deficient dietary intake of the vitamin that may be complicated by other

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[1] For a review see, M. C. Latham, 1969, "International Nutrition and Later Learning," Assn. for Childhood Educ. International, Wash. For detail see a.o.: N. S. Scrimshaw and J. E. Gordon (ed.), 1967, "Malnutrition, Learning and Behavior," M.I.T.

factors, such as certain infectious diseases, and leading to serious clinical lesions of the eye" (Van Veen, 1974).

From the clinical point of view, xerophthalmia is classified according to its stages as (Oomen, 1973):

X.0.--only night blindness present.
X.1.--when dryness or xerosis of the conjunctiva occurs, with or without Bitot's spots.
X.2.--xerosis of the cornea; superficial, reversible changes of the corneal epithelium. These three stages are reversible.
X.3.--irreversible corneal changes, involving the corneal stroma, leading to loss of substance and perforation, and possibly keratomalacia.
X.4.--scars presenting as nebula, a total or partial leucoma, a staphyloma or phtisis bulbi.

The irreversible stages (X.3 and X.4) appear in severe cases and are often accompanied by the manifestations of PCM. The early stages which are reversible are more prevalent, and therefore deserve special consideration in terms of prevention.

A world-wide survey of xerophthalmia carried out by WHO in 1962-1963 in nearly 50 countries, indicated that the countries most affected by this problem were: Indonesia, South India, Ceylon, East Pakistan, the Philippines, Viet Nam, Central America, Haiti, Northeast Brazil, North and Central Africa, Egypt, Sudan, Jordan, Syria and Iraq (Oomen, 1964). Indonesia is one of the more frequently mentioned countries in publications relating to vitamin A problems. Aside from the influence of the publications of Oomen and Van Veen in Indonesia, this suggests also the significant magnitude of the problem in Indonesia compared with that in other countries.

The extent of vitamin A deficiency in Indonesia has been recognized in various regions since the 1930's. Between 1930-1950, cases with or without xerophthalmia were reported by not less than 10 workers, in areas such as: Aceh, Batak Karo, Palembang, Jakarta, several villages in West and Central Java, and Makasar. The names of Tijssen, De Haas, Maas, Van Stockum, Oei Djoen Hoat, Postmus, Van Veen and others, are associated with work in this field (Postmus, 1949; Oomen, 1957; Blankhart, 1967; Karyadi, 1968).

In the decades after the 1950's, various aspects of the problem have been studied by Oomen, Blankhart, Rawi, Poorwo Soedarmo, Karyadi, Roels, K. H. Teng, Djaeni Sediautama, Poey Seng Hin, Doesschate and some others (Karyadi, 1968). This period was also recognized as the years of "the Red Palm Oil Experiment" designed to prevent and alleviate xerophthalmia in several villages in Bogor and Central Java (Karyadi, 1968; Lian, 1967).

Despite their initial success, the trials were abandoned and no larger scale programs using Red Palm Oil were ever developed. Difficulties in procurement and distribution and the unacceptable taste and color were probably the main reasons why these programs were discontinued. It should be noted that in many West African countries xerophthalmia is very uncommon because of the use of Red Palm Oil in cooking. For Indonesia, a more practical approach has been developed, namely massive dose vitamin A. It has already proved to be effective in reducing the incidence of xerophthalmia in India and elsewhere (Van Veen, 1974). This approach has been undertaken in Indonesia beginning in 1973 in 20 villages of Java, covering more than 100,000 children. A preliminary report from Central Java shows a significant reduction in the incidence of xerophthalmia after 6 months of administering a capsule containing 200,000 IU of vitamin A and 40 IU vitamin E (Table 6) (Tarwotjo, personal communication).

Table 6. XEROPHTHALMIA CASES AMONG CHILDREN 1-4 YEARS IN CLINICAL STUDY, AFTER 6 MONTHS OF VITAMIN A PROVISION, URBAN AND RURAL, CENTRAL JAVA, 1974

	Urban		Rural	
	n	Incidence	n	Incidence
First Examination	1,438	61 (4.3%)[a]	1,374	71 (5.2%)[a]
Second Examination (after 6 months):				
Experimental group with vitamin A	623	3 (0.5%)	663	4 (0.6%)
Control group	599	16 (2.5%)	584	27 (4.6%)

a/ They were dropped/not included in the experiment.
Source: Tarwotjo, personal communication.

The foregoing demonstrates that the vitamin A problem in Indonesia has received probably more attention than PCM. This is rather unusual, as in many other countries vitamin A deficiency tends to be a neglected problem (McLaren, 1964; McLaren, 1969; Van Veen, 1974).

With limited resources, an effort to undertake a short term program with an observable outcome is feasible for xerophthalmia but not for PCM.

The Extent of Xerophthalmia in Indonesia

Most of the data on the prevalence of xerophthalmia are recorded from hospitals, and only a few from field surveys. However, as xerophthalmia has been described as a disease of "a poor man's child" (Oomen, 1964), hospital figures may reflect to a certain extent the situation in the community. In Indonesia the public or government hospitals are also considered "a poor man's hospital".

The difficulties encountered in collecting figures relating to vitamin A deficiency are due in part to the inconsistency in terminology and criteria. Some figures are based on biochemical and clinical criteria, and others on clinical features only. Some percentages denote the proportion of cases out of all children observed or admitted at clinics or hsopitals and others indicate the onset of xerophthalmia in a certain age group (usually 1-5 years) out of the total cases examined at all ages.

An endeavor has been undertaken here to compile the scattered data which are presently available. Only the data using clinical features are collected, and the percentage given is the proportion of xerophthalmia cases out of all the observations or admissions. Thus, no limitation of age is considered. It should be kept in mind that xerophthalmia occurs mainly in children with a peak between age 1-4 years (Oomen, 1957).

The results presented in Table 7 demonstrate a substantial variation from place to place, ranging from 1.6 to 22 percent. This is not surprising as one of the characteristics of xerophthalmia is its seasonal periodicity due to the seasonal occurrence of infectious diseases and availability of food rich in vitamin A (Oomen, 1973). Consequently, comparing such data to assess the extent of the problem by place and time may be erroneous. For this purpose, census figures referring to a few definite questions about blindness as suugested by Oomen, McLaren, Van Veen and others, are probably the most useful. The drawback of this approach, however, is the possibility of under-estimation, because many victims will have died and will then be uncounted (McLaren, 1969).

Very recent figures on xerophthalmia recorded in the hospitals in Indonesia are included in a paper by Oomen in Nutrition Reviews of June 1974 (Oomen, 1974). The data indicate the continuing problem of xerophthalmia in Indonesia. It seems likely as a cause of blindness to compete with trachoma, a disease that affects all ages (Table 8).

Epidemiology

Many authors have described the complex nature of the pathogenesis of xerophthalmia. As stated by Oomen:

> "The clinical picture we see is composed of hues and colors, not only related to vitamin A one congeners, but also to dietary protein and fat moieties, to calories, perhaps to water intake, and certainly not least to the obscuring factors of infectious disease. Even the story is incomplete...." (Oomen, 1969, p. 1102).

Popkin is probably the only one who has tried to analyze the complexity of xerophthalmia in depth by using multiple regression approach. He studied the extent and associated factors of xerophthalmia in the villages (barrios) as well as squatter areas of Cebu, the Philippines.[1] The objectives were to determine the most effective program for preventing xerophthalmia in the Philippines (Popkin, 1974).

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[1] The study is a part of the large study conducted by Florentino Solon of the Cebu Institute of Medicine in collaboration with Cornell University.

Table 7. THE PREVALENCE OF XEROPHTHALMIA IN INDONESIA RECORDED FROM HOSPITALS AND COMMUNITY

Regions/Country	Year	n	Percent Xerophthalmia	Recorded From:	References
Indonesia:					
1. Pacet, West Java	1937	487	5.0	village	Van Veen, 1950
2. Kemayoran, Jakarta	1953	415	22.0	squatter	Oomen, 1953
3. Jogyakarta and Semarang	1953	7,000	4.0	hospital	Oomen, 1957
4. Semarang	1958/59	5,699	6.0	hospital	Oomen, 1964, p. 276
5. Bogor	1959	156	12.8	squatter	Blankhart, 1967
6. Pondok Pinang, Jakarta	1960-66	877	13.0	semi-rural village	Saroso, 1972
7. Bogor	1967	2,487	7.1	nutrition clinic	Karyadi, 1968
8. Central Java: --rural	1963	867	4.0	village	Gyorgy, 1966
9. Central Java: --rural	1973	1,374	5.2	village	Tarwotjo, 1973[a]
--urban	1973	1,438	4.3	squatter	Ibid.
10. Jakarta	1968	118,631 35,048*	1.64 5.56*	hospital	Sutedjo, 1968
Philippines	1961	29,746	8.9	hospital	Oomen, 1964, p. 277
Ceylon I	1955/58	5,245	8.4	north hospital	Ibid., p. 288
Ceylon II	1955/58	16,124	0.5	child hospital	Ibid.
East Pakistan	1962	537	18.6[b]	hospital	Ibid., p. 289

* Number classified as malnourished, 5.56 percent of them had xerophthalmia.

a/ Personal communication.

b/ Recorded as xerosis and keratomalacia.

Table 8. CASES OF XEROPHTHALMIA AND TRACHOMA IN INDONESIA IN 1972
(From Reports to the Eye Health Department of the Ministry of Health)

Region	Eye Patients Seen On First Visit	Patients With Trachoma All Stages	Patients With Xerophthalmia All Stages	Patients With Xerophthalmi
	(number)	(number)	(number)	(percent)
West Java	49,372	4,211	1,879	3.8
Central Java	140,692	11,574	5,962	4.2
Jogyakarta District	8,016	128	256	3.2
Lampung (Sumatra)	26,020	1,007	548	2.1
West Kalimantan	2,568	624	74	2.8
South Kalimantan	12,155	701	162	1.2
South Sulawesi	16,094	877	648	4.0
Bali	11,315	498	316	2.8
Total Indonesia	375,314	24,932	11,600	3.1

Source: Oomen, H. A. P. C. (1974), "Vitamin A Deficiency, Xerophthalmia and Blindness," Nutr. Rev. 32: 161.

In his approach, Popkin developed a functional model to demonstrate the variables involved in the onset of xerophthalmia. Using a statistical analysis, he attempted to evaluate the nature of the interaction among the variables. Thereby, the determinant of the problem might be predicted. Although the validity of the model needs to be tested further, it is probably worth citing here:

$$X = f\,(\text{Na, NaNp, NaNf, DNa, DBNa, Zone, Age, Sex})$$

X = xerophthalmia (clinical and biochemical);
Na = dietary intake of vitamin A;
Np = protein dietary intake deficiency;
Nf = fat dietary intake deficiency;
D = a series of disease effects on vitamin A status, including the effects on : absorption, conversion, increase requirement, and anorexia;
Zone = ecological zone.

Each of the variables then was broken down further into several subvariables. For example, vitamin A intake (Na) is affected by the total food expenditures of the family (economic status), home food production, beliefs related to foods, etc.

One interesting phenomenon is the "xerophthalmia provoking effect of rice". This was first observed by Oomen using Klerk's data on nutritional parameters in school boys in urban and rural areas of Java (Table 9). The urban rice-eating boys have a reasonable protein intake, but low intake of vitamin A, and a significant number showed Bitot's spots. The rural cassava eaters had a very low protein intake but an acceptable intake of vitamin A and no Bitot's spots were found in them. In the latter region, kwashiorkor cases regularly occurred, but xerophthalmia only rarely (Oomen, 1969, p. 1103).

Table 9. PROTEIN AND VITAMIN INTAKE AND BLOOD LEVELS IN JAVANESE SCHOOL BOYS

	54 Low Standard, Urban a/	64 Low Standard, Rural b/	Significance
Intake:			
Protein, g/day	37.5 ± 2.9	9.8 ± 0.7	
Vitamin A, IU, g/day	1,811 ± 738	3,356 ± 673	
Blood levels:			
Hemoglobin, g/100 ml	11.9	12.0	
Total Protein, g/100 ml	7.7	6.7	<0.01
Albumin, g/100 ml	4.0	3.2	<0.01
Vitamin A, g/100 ml	23.0	39.0	<0.01
Carotene, g/100 ml	42.0	157.0	<0.01
Bitot's spots, total	4/67	0/254	<0.01

a/ Djakarta
b/ Gunung Kidul
Source: Oomen, H. A. P. C. (1969), "Clinical Epidemiology of Xerophthalmia," Am. J. Clin. Nutr. 22: 1103.

The conclusion drawn from this table is not convincing, because many other variables are not controlled. However, the papers of Oomen and Doesschate published in 1973 give more assurance. In their analysis of the seasonal periodicity of xerophthalmia, they found that in Surabaya the peak of xerophthalmia was in the dry season where rice is abundant and fruits and vegetables are scarce. In Bandung, where rice is produced throughout the year, the peak occurs when the production is maximum (Oomen, 1973). The high prevalence areas for xerophthalmia in South Asia are also rice eating (Oomen, 1964).

The information on the food pattern of pre-school children in Indonesia seem likely to support this hypothesis. Rice is always considered the best food for children. Nothing else is considered necessary as long as the child is given rice (Tan, 1970). In cassava areas, the common basic diet consists of a mixture of cassava, maize (yellow), sweet potatoes (yellow), and rice. This diet then provides more vitamin A than the rice diet (Bailey, 1961b).

A question worth raising is: Why do only some children in an area with families living in similar conditions develop xerophthalmia? This question again calls for an astute analysis of the problem. Undoubtedly it is affected by, for example, the question of food and health beliefs, intra-family food distribution, and various subtle differences in other factors affecting health and dietary conditions of children (Popkin, 1974).

Public Health Significance

a. Blindness

According to McLaren, there are five different ways in which vitamin A deficiency may cause blindness: only two occur in man. One, a process of blindness which is reversible when vitamin A is promptly administered. The other is irreversible due to scarring and grosser lesions destroying the whole eyeball (McLaren, 1969).

In 1930 it was estimated that there were 130,000 blind people in Indonesia out of a total population of 60 million. Most of the blind, approximately 100,000, live in Java. This number increased to 170,000 and 125,000 respectively in 1958 when the population was about 80 million (Salim, 1958). In 1972, according to the Department of Health, the figure for Indonesia was 120,000, a majority of them in the younger age groups (Tarwotjo, personal communication). At the Cicendo Hospital in Bandung, in the early 1960's, 82 percent of the completely blind patients between infancy and 9 years of age lost their sight because of vitamin A deficiency (Roels, 1962).

Popkin reported the results of the CIM-Cornell field survey on blindness in Cebu. They found an incidence of blindness associated with xerophthalmia to be one out of every 661 children between the ages of 1-6 years. They found a smaller incidence in the older age groups (Popkin, 1974). The blindness pattern is expected to be similar in Indonesia.

Blindness is certainly not merely an economic problem. The human sufferings of being blind and the social consequences for the individual and the family make vitamin A deficiency a problem of major public health importance.

As anticipated, despite the thoughtful attention paid to it by most of the scientists in this field, little has been done to seriously combat this easily preventable human disease. This is particularly true in Indoneisa. It is probably worth quoting Oomen's statement at the Nutrition Conference in Princeton, New York, in 1958:1/

> "Xerophthalmia has been the most bitter pill for me to swallow during 18 years of doctor's work in Indonesia. The over and over repeated experience of discovering a child, recently blinded, in the arms of the mother - having to tell her that I now could do nothing more to save its eyesight, remembering that I could have done so with a few spoonfuls of cod-liver oil some days ago - these things still enter my nightmares. They belong to the most vivid examples of what disprivileged people in underdeveloped regions sometimes miss.
>
> What do I find in textbooks and scientific publications if I want to have real information about this horrible, though easily curable, condition? Textbooks on tropical diseases tell you everything about Rift Valley fever, melioidosis, and blastomycosis, but they may not spend one word on xerophthalmia. Every nutrition journal flows over with vitamin A, for instance in heifers, turkeys, and ducks, which are eaten by the best-fed people in the world. More printing space nowadays is devoted to a few cases of hypervitaminosis A, induced by an irresponsible vitamin racket, than to the thousands of small children who die or become blind every year due to the lack of a handful of vitamin A units. What on earth is nutritional science good for if, even in the atom age, it is not capable to counteract one of the foulest consequences of bad nutrition? Do you realize that since the days of Mori, 60 years ago, not in Japan, but in countries like Indonesia, not one step forward has been taken, in spite of a mountain of thoughtful attention paid by doctors?"

The essence of Oomen's statement is still valid in Indonesia today. A much more serious endeavor to combat vitamin A deficiency is deserved.

b. Susceptibility to Infections and Mortality

It has been shown that vitamin A deficiency could induce infections due to the decreasing ability of the body to resist the disease. The prognosis in children with severe xerophthalmia is considered poor. The mortality in children is high (25-60 percent) with a tendency for the highest rates to be found in the youngest age group (McLaren, 1969). The exact mortality rate due to vitamin A deficiency is not known in Indonesia.

1/ Quoted from: J. Am. Med. Women Assn., 17: 5, 1962, p. 405.

Many authors reported the existing association between xerophthalmia and diarrhea (e.g., Jelliffe, 1955). The nature of that association is unclear (Popkin, personal communication). Overall, there appears to be a high mortality rate associated with xerophthalmia although the exact nature of this relationship has not yet been adequately studied.

Nutritional Anemia

Although nutritional anemias are known to be among the major health problems in many developing countries (WHO, 1968), the studies in this field are scanty. This is probably because standard methodologies and criteria for nutritional anemia have only recently been developed, and even now a further standardization is being undertaken (WHO, 1972).

Indonesia is no exception. Of more than 300 publications on nutritional research between 1850-1950, only 2 or 3 relate to nutritional anemias (Postmus, 1955). Thereafter, until 1970, among more than 100 publications, there are only 2 appearing on this subject (Hermana, 1971).

Before WHO established criteria for defining anemia, there were 2 studies frequently cited in Indonesia. The first was a study by Njo Tiong Tjiat and Poorwo Soedarmo in 1957 and the second by Hoo Swie Tjiong in 1962. The former tried to relate the food consumption of pregnant women to the incidence of anemia, and the latter was a more elaborate study on various aspects of anemia and pregnancy. Both were carried out in the General Hospital in Jakarta (Tjiong, 1962).

The difficulty encountered in dealing with anemia is the differences in opinion as to what criteria to be used. WHO defined nutritional anemia as

> "a condition in which the hemoglobin concentration of the blood is below the accepted normal value, due to a deficiency of one or more nutrients essential to erythropoeisis, regardless of the cause of the deficiency" (WHO, 1968).

Standard criteria for hematological values have also been established by WHO (Table 10). Therefore, the discussion in this section will be based on the above definition unless otherwise stated.

Prevalence

As mentioned above, the first study on nutritional anemia in the 1950's in Indonesia was carried out by Njo Tiong Tjiat and Poorwo Soedarmo. Among 290 pregnant women in the Jakarta hospital, they found 23 percent with "good", 17 percent "sufficient", and 60 percent with a "poor" food intake. The latter were considered anemic, as the hemoglobin level was lower than the normal standard adopted (Tjiat, 1957).

Hoo Swie Tjiong, in the same hospital, in 1962 found various degrees of anemia among 3,531 pregnant women. Fifty percent were considered mild, 39.9 percent moderate, and 9.4 percent severe anemia.[1] He also pointed out that

---

[1] Mild: Hb, 8-10 g/100 ml.; moderate: Hb, 6-8 g/100 ml.; severe: Hb, less than 6 g/100 ml.

Table 10. WHO INDICES SUGGESTIVE OF NUTRITIONAL ANEMIA

1. Haemoglobin concentration below which anemia is likely to be present at sea level:

	g/100 ml.
Children:	
6 months - 6 years	11
6 - 14 years	12
Adult Male:	13
Adult Female Non-pregnant:	12
Adult Female Pregnant:	11

2. Means corpuscular haemoglobin concentration:

   Levels below 31 are likely to indicate iron deficiency

3. Serum iron concentrations and percentage saturation of transferin:

	normal	prob. deficiency
Serum Iron (ug/100 ml)	80 - 180	less than 50
Saturation of Transferin (%)	20 - 50	less than 15

SOURCE: WHO, 1972, "Nutritional Anemia," WHO Tech. Rep. Series, No. 503.

60 percent were diagnosed as iron deficiency, 29 percent megaloblastic, 8 percent hypoplastic, 0.7 percent hemolytic anemia, and 2.2 percent anemia with unknown etiology (Tjiong, 1962).

It should be noted that hospital studies, for various reasons, do not provide data representative of a whole country or community.

In 1969 a field survey among pregnant and non-pregnant women was initiated in Bogor area by Soekartijah _et al_. (Martoatmodjo, 1972). This study was then extended into several other rural areas in West and Central Java and Bali (Karyadi, 1973b). Of a group of 357 pregnant women, hemoglobin levels below 11.0 g/100 ml. ranged by area from 50-92 percent of subjects; the percentage among 214 non-pregnant women was 35-85 percent (Table 11). This prevalence is comparable to those of India (New Delhi and Vellore) but almost double that in Mexico and Venezuela (WHO, 1968).

Table 11. PREVALENCE OF ANEMIA BASED ON THE HEMOGLOBIN LEVEL, WHO STANDARD[a]

Regions/ Country	Pregnant		Non-Pregnant		Males	
	n	Percent Anemic	n	Percent Anemic	n	Percent Anemic
Indonesia:						
Bandungan	40	92.5	84	84.6	34	35.2
Bogor area	109	68.8	75	35.1	--	--
Indramayu-Purwakarta	51	78.4	21	56.0	10	50.0
Gunung Kidul	54	50.9	34	44.1	53	28.3
Bali	57	54.6	31	38.7	25	36.0
Bali	46	46.9	19	47.3	31	16.1
India:						
New Delhi	100	80.0	95	64.3	--	--
Vellore	100	56.0	100	35.0	99	6.0
Mexico	124	26.6	110	11.7	111	0.9
Venezuela	95	37.0	107	14.9	52	1.9

[a] WHO standard: Less than 11 g/100 ml. for pregnant women, and 12 g/100 ml. for non-pregnant women.

Source: For Indonesia: Darwin Karyadi, 1973, "Studies on Nutritional Anemia in Indonesia," working paper WHO-SEA Consultation on Nutritional Anemia, New Delhi (personal communication). For other countries: WHO, 1968, "Nutritional Anemias," Tech. Rep. Ser. No. 405.

No data are available as to what proportion of the anemia in these surveys in Indonesia is attributed to iron deficiency. Hematological diagnosis from one of the areas (Bendungan, Bogor area), however, suggests that 10-38 percent of the anemic women in this area is due to the iron deficiency (Martoatmodjo, 1972).

The high prevalence of anemia among males in Indonesia in comparison to other countries, suggests that anemia in Indonesia is widespread among the entire population in rural areas.

In 1972 the World Bank, within the framework of its study on the use of labor and equipment in civil work construction, established a joint research project on anemia with the Indonesia Institute of Nutrition Research. The first study was undertaken in three locations of West Java and Jakarta, where canals and roads were being constructed. The second study concentrated on the rubber plantation workers in West Java. A total sample of nearly 1,000 workers was taken in those studies. Aside from establishing the magnitude of the problem of anemia an experiment on the effect of anemia on work capacity and performance before and after the administration of iron (ferrous sulfate) were also carried out (Karyadi, 1973a; Basta, 1974b). The present author participated in these studies.

Among 573 male construction workers studied in 1972, the prevalence of anemia was 28-52 percent; most (78-92 percent) was iron deficiency anemia. Moderate and severe anemia with hemoglobin below 11 g/100 ml. was found in 12 percent of all workers (Table 12-13). In the second study, among 398 plantation workers (tappers and weeders), 45 percent were anemic (Table 14), of which 60 percent was due to iron deficiency anemia. The moderate and severe cases in this group formed a half (6 percent) of that in the construction workers. It was found that the severity of the anemia was positively correlated with the degree of hookworm infestation. The latter group of workers had a lower degree of infestation (Basta, 1974b).

There is evidence that iron deficiency anemia in children is also high. An incidence of 50 percent in children visiting the outpatient clinic of the Child Health Department of the General Hospital in Jakarta was reported by Odang and Kho Lie Keng in 1962 (Odang, 1959). Table 15 shows the hematological diagnosis of anemic children admitted to the same hospital in 1960-1962 as provided by Sutedjo and quoted by Karyadi (Karyadi, 1972).

Epidemiology

It has been known for many years that the main basic causes of iron deficiency are: (i) an inadequate availability of and/or inadequate absorbable iron in the diet, (ii) excessive losses of iron from the body, primarily due to hookworm infestation, and (iii) nutritional factors in the host (Woodruff, 1961; Nutrition Review, 1968; Basta, 1974a).

As in the case of PCM and xerophthalmia, the nature of the interaction of the host, the agent and the environment in the pathogenesis of nutritional anemia is also complex. An anemic individual will tend to work less, and thus earn less income. This in turn predisposes him to a poorer food intake, aggravating further the anemia and increasing his susceptibility to infection.

Table 12. HEMOGLOBIN AND HEMATOCRIT DISTRIBUTION
(Construction Sites)

Site Number Examined	Rentang 131		Saladarma 125		Halim 317	
	No.	%	No.	%	No.	%
Hemoglobin (g/100 ml.)						
>15.0	11	8.4	16	12.8	60	18.9
13.0 - 14.9	54	41.2	54	43.2	157	49.6
11.0 - 12.9[a]	45	34.3	40	32.0	76	23.9
9.0 - 10.9[a]	16	12.3	8	6.4	14	4.4
≤8.9[a]	5	3.8	7	5.6	10	3.2
Mean	12.7		13.0		13.5	
Standard Deviation	2.2		1.2		1.8	
Hematocrit (percent)						
>44	17	13.0	17	13.6	50	15.8
38 - 43	75	57.2	70	56.0	202	63.8
32 - 37[a]	31	23.7	30	24.0	55	17.3
26 - 31[a]	7	5.3	8	6.4	7	2.2
≤55	1	0.8	0	0.0	3	0.9
Mean	39.1		39.3		40.0	
Standard Deviation	5.1		4.5		4.2	

---

[a] Below anemia cutoff point. Hemoglobin of 12.9 g/100 ml. (roughly equivalent to hematocrit (packed cell volume) of 37% or 38%) and below signifies anemia according to WHO criteria.

Source: Karyadi, 1973a

Table 13. SERUM IRON, TIBC AND TRANSFERRIN SATURATION AMONG ANEMIC WORKERS (High Cutoff Point)[a]
(Construction Site)

Site Number Examined	Rentang		Saladarma		Halim	
	38		37		89	
	No.	%	No.	%	No.	%
Serum Iron (mcg%)						
>70	1	2.6	3	8.1	15	16.9
50 - 69	3	7.9	7	18.9	25	28.1
30 - 49	22	57.8	17	45.9	35	39.2
10 - 29	9	23.8	9	24.4	11	12.4
<9	3	7.9	1	2.7	3	3.4
Mean	34.7		41.0		48.5	
Standard Deviation	15.1		18.5		20.3	
T.I.B.C. (mcg%)						
≤325	0	0.0	0	0.0	0	0.0
400 - 326	3	7.9	8	21.6	9	10.1
475 - 401	21	55.3	22	59.4	66	74.2
550 - 476	10	26.3	6	10.3	12	13.5
>551	4	10.5	1	2.7	2	2.2
Mean	467.0		438.0		443.8	
Standard Deviation	58.5		52.3		42.4	
Transferrin Saturation (%)						
>20	0	0.0	3	8.1	5	5.6
15 - 19	3	7.9	5	13.5	14	15.7
10 - 14	10	26.4	9	24.3	35	39.4
5 - 9	18	47.3	15	40.6	26	29.3
≤4	7	18.4	5	13.5	9	10.1
Mean	8.2		10.1		10.9	
Standard Deviation	4.2		6.3		5.1	

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a/ Based on hematocrit values below 38.
Source: Darwin Karyadi, *op. cit.*

Table 14. DISTRIBUTION OF HEMOGLOBIN AND HEMATOCRIT VALUES FOR TAPPERS AND WEEDERS (Plantation Sites)

	Weeders		Tappers	
	n	%	n	%
Hemoglobin (g/100 ml.)				
above 14.9	7	5.0	12	4.8
13.0 - 14.9	76	51.2	122	48.8
11.0 - 12.9	53	35.8	103	41.2
9.0 - 10.9	10	6.7	12	4.8
below 9.0	2	1.3	1	0.4
Number examined	148		250	
Mean	13.0		13.0	
Standard Deviation	1.4		1.4	
Hematocrit (%)				
above 43	15	10.1	28	11.1
38 - 43	88	59.4	167	66.7
32 - 37	42	28.6	52	20.7
26 - 31	1	0.6	4	1.5
below 26	2	1.3	--	--
Number examined	148		251	
Mean	39.5		40.2	
Standard Deviation	4.1		3.6	

Source: Basta, 1974.

Table 15. NUMBER OF CHILDREN WITH ANEMIA ADMITTED AT THE DEPARTMENT OF CHILD HEALTH, GENERAL HOSPITAL, JAKARTA (1960-1962)[a]

Anemia	Number of Cases Admitted			Percentage of All Admitted Children		
	1960	1961	1962	1960	1961	1962
Megaloblastic	70	80	38	2.1	2.5	0.9
Iron Deficiency	20	46	111	0.6	1.4	2.7
Hemolysis	16	26	13	0.5	0.8	0.3
Aplastic	153	152	103	4.5	4.7	2.6
Hemorrhagic	12	20	18	0.4	0.6	0.4
Leucemia	19	15	25	0.6	0.5	0.6
Total	290	339	308	8.7	10.5	7.5

a/ Quoted from Sutedjo's inaugural speech in 1963 by Darwin Karyadi (Karyadi, 1973).

The following data suggest that it is difficult to assess which are the determining factors in the onset of anemia. However an intervention program including the administration of sufficient elemental iron may often be able to correct the hemoglobin level without taking measures to alter the environmental factors playing a role in the etiology of anemia.

Dietary Iron

The dietary surveys carried out in West and Central Java by Sumilah Sastroamidjojo et al. (Sastroamidjojo, 1973) revealed that most of the males and females had nutrient intakes below the Recommended Dietary Allowances (RDA) used for Indonesia, particularly calorie, protein and vitamin C. There is no significant difference between the intake of pregnant and non-pregnant women, except for iron. The latter appeared to consume more iron as did the males; the iron intake of these groups are close to the RDA for non-pregnant women and exceed the RDA for the males (Figure 3). However, the iron here is mainly from vegetable sources and this is known to be poorly absorbed (5-10 percent) by the body (WHO, 1968).

A somewhat similar pattern observed among the construction and plantation workers in the other study was anticipated. In general, the nutrient intakes were inadequate, though there were variations among the groups. For example the construction workers were better off in terms of calorie, protein and iron, but low in vitamin C. The plantation workers, on the other hand, had higher vitamin C intake and less calorie, protein and iron. The environment and proportion of income spent on foods were likely to have been the factors which caused the discrepancy.

A further dietary analysis in the latter study also demonstrated that the dietary intakes and the nutritional status of the non-anemic workers appeared to be better than the anemic groups. In the construction workers, higher hemoglobin levels were positively correlated with higher caloric and protein intakes. In the Non-anemic plantation workers, a significant correlation between hemoglobin levels and vitamin C intake was found. The vitamin C intake of this group was almost double the amount of that ingested by the anemic subjects. This phenomenon is likely to support the hypothesis that vitamin C appears to considerably enhance the absorption of iron.1/

In the pre-school children, nutritional anemia is usually encountered together with PCM (Karyadi, 1973b). Thus, in short, the availability of iron in the diet is not likely to be the only causal factor in the appearance of iron deficiency anemia in Indonesia. The caloric, protein and vitamin C content of the diet may also play a role. An adequacy of these nutrients will help to guarantee an adequacy of iron in the diet.

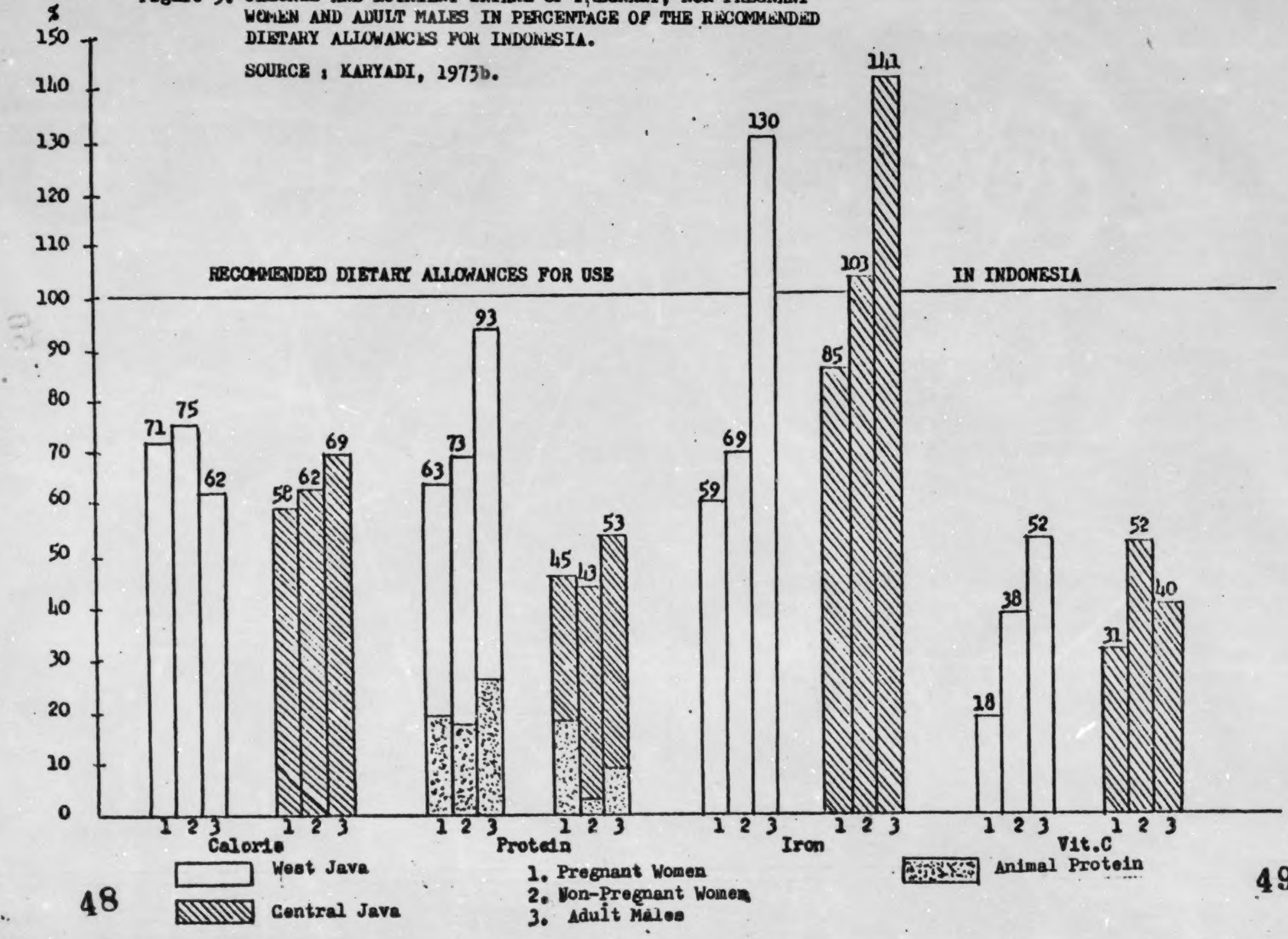
Infections, Nutritional Status and Anemia

The fact that intestinal helminthic infestations, especially hookworm, enhance the onset of iron deficiency anemia has been well documented (Nutrition Review, 1968). The synergistic interaction between the nutritional status of the host and infection and vice versa has been discussed briefly in another section.

1/ Vitamin C promotes the absorption of iron by 30% to 50% (Callender, S.T.E. as quoted by Basta, 1974a).

Figure 3. CALORIE AND NUTRIENT INTAKE OF PREGNANT, NON PREGNANT WOMEN AND ADULT MALES IN PERCENTAGE OF THE RECOMMENDED DIETARY ALLOWANCES FOR INDONESIA.

SOURCE : KARYADI, 1973b.



The incidence of intestinal helminths among the construction and plantation workers was high. Eighty percent of them suffered from hookworm infestation. The severity of the anemia was related to the intensity of the hookworm infestation (Table 16 and Figure 4).

Table 16. RELATION OF STOLL COUNT TO HEMOGLOBIN (HB) AND HEMOTOCRIT (HT) VALUES AT HALIM (Construction Sites)

Score	Intensity Grouping (eggs per ml. of feces)	Number	Clinical Classification	Hb Mean ± S.D.	Ht Mean ± S.D.
0	100	25	Normal	13.7 ± 1.06	40.9 ± 2.2
1	100- 699	18	Very light	13.9 ± 1.29	41.2 ± 2.8
2	700- 2,599	38	Light	13.6 ± 1.79	41.6 ± 4.7
3	2,600-12,599	48	Moderate	13.0 ± 1.76	39.1 ± 3.7
4	12,600-25,099	12	Heavy	11.9 ± 2.08	38.7 ± 4.0

Source: Darwin Karyadi, 1973a

Public Health Significance

Morbidity and Mortality Due to Anemia

Various studies on anemia in pregnant women in India by Muktha Sen in 1955, Pandit in 1948, and Das Gupta in 1951, demonstrated that anemia is an important cause of maternal death, prematurity, still-birth and neonatal mortality (Woodruff, 1961). It has been documented also that anemia increases the susceptibility to infection in animals as well as in man (Woodruff, 1961; Basta, 1974a).

Data available from a study on perinatal mortality in the General Hospital in Jakarta, in 1963-1967, showed that perinatal and maternal mortality are still high. For maternal mortality, particularly, the rate is as high as ever, viz. 13 per thousand (Table 17).1/ Anemia was the primary cause of poor health in most of the pregnant women admitted to this hospital (Table 18) (Sumarmo, 1971).

The prevalence of acute and chronic infections was recorded as being higher in the anemic than in the non-anemic workers (Table 19). After the administration of 100 mg. elemental iron (ferrous sulfate) for 60 days, the prevalence of infections went down as the hemoglobin levels improved. In the control group, no change was observed (Table 20) (Basta, 1974a).

The Effects on Physical Endurance and Productivity

Physical endurance differs from productivity in that the first refers to the ability to perform certain physical tests under an artificial environment and the second refers to the output of physical work in a real situation.

1/ In the early 1950's, the figures were 12-16 per thousand.

Figure 4. SCHEMATIC DIAGRAM OF RELATIONSHIP BETWEEN HAEMOGLOBIN AND SEVERITY OF HOOKWORM INFECTION (MEAN ± S.D.)

REPRODUCED FROM : BASTA, 1974b

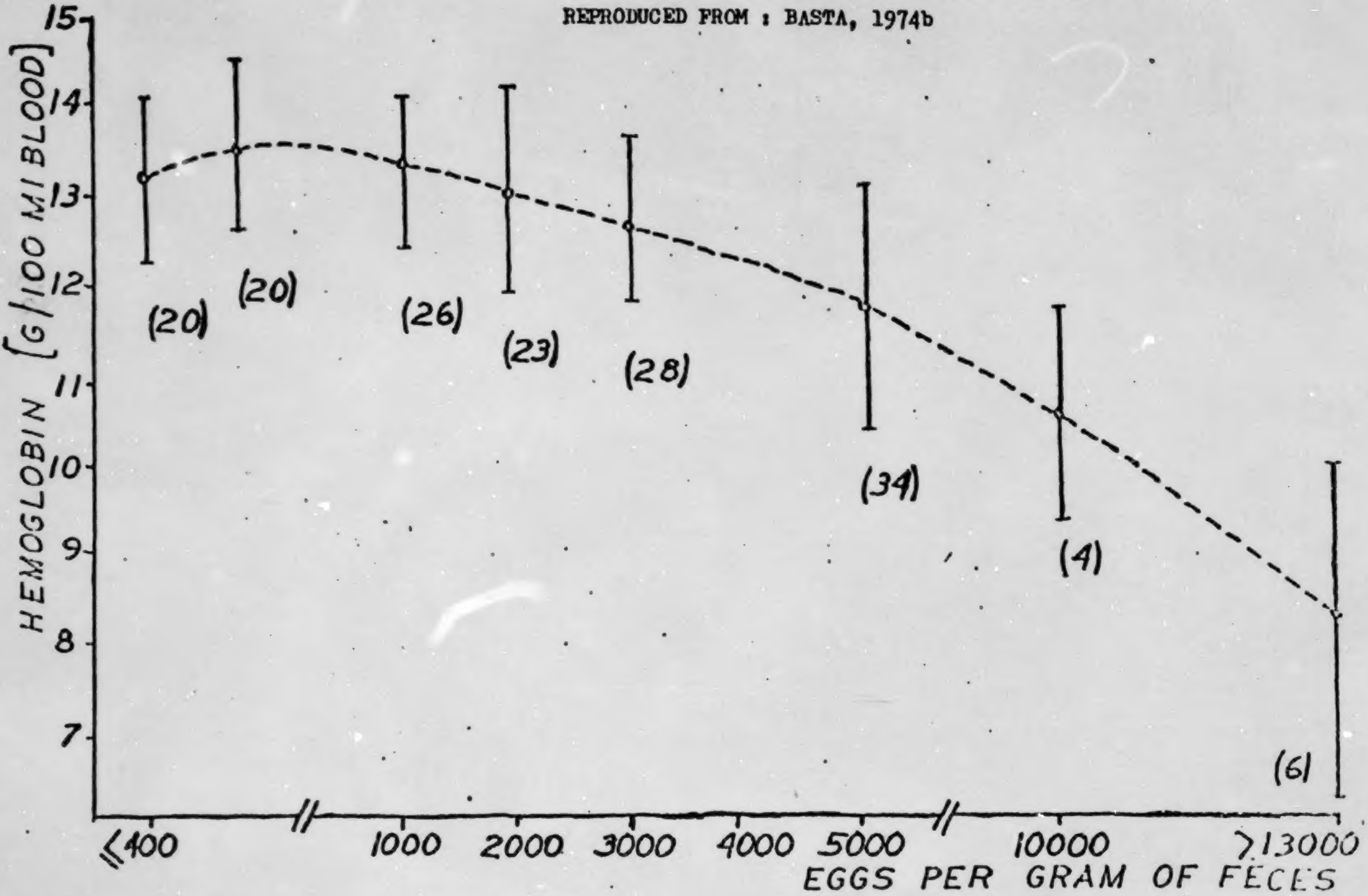


Table 17. MATERNAL AND FETAL DEATH, GENERAL HOSPITAL JAKARTA, INDONESIA, 1963-1967 and 1970

Period	Deliveries	Live Birth	Fetal Death/ Still Birth	Maternal Death	
				Registered	Emergencies
1963	2,847	2,494	262	0	31
1964	2,853	2,555	291	2	26
1965	2,585	2,293	338	1	50
1966	2,480	2,247	315	3	52
1967	2,519	2,239	361	0	28
1970	2,957	2,622	335	1	20

Source: Sumarmo *et al.*, 1971, "Perinatal Mortality in Dr. Tjipto Mangunkusumo, General Hospital, Jakarta," Paed. Indon., 11: 67-74.

Table 18. MATERNAL MORBIDITY IN PREGNANCY AND LABOR, GENERAL HOSPITAL, JAKARTA, INDONESIA, 1969 and 1970

	1969	1970
Number of Deliveries	3,246	2,957
Morbidity:		
1. Anemia	1,956	2,373
2. Heart Disease	44	46
3. Diabetes Mellitus	7	5
4. Toxemia	141	171
5. Pre Eclamsia	39	36
6. Eclamsia	81	75
7. Solutio Placentae	56	85
8. Placenta Praevia	189	179
9. Other causes of antepartum hemorrhage	171	138
10. Prolonged labor	71	95
11. Infection during labor	160	151
12. Uterine Rupture	34	42
13. Atonia Uteri	54	52

Source: Sumarmo *et al.*, *op. cit.*

Table 19. PREVALENCE OF ACUTE AND CHRONIC INFECTIONS IN THE ANEMIC AND NON-ANEMIC INDIVIDUAL BEFORE TREATMENT (Plantation Sites)

Disease	Percent Prevalence	
	Anemia Group	Non-Anemic Group
	(n = 181)	(n = 221)
Influenza	7.5	4.8
Bronchitis	2.5	0.8
Tuberculosis	1.7	none
Tonsilitis Chronica	1.7	none
Enteritis	3.3	2.4

Source: Basta, 1974b.

An extensive review of the literature undertaken by Basta (Basta, 1974a) indicated that there is ample evidence proving that there is correlation between anemia and physical endurance. However, very little work has been done on productivity. The anemia study carried out in Indonesia among the construction and plantation workers in 1972-1973, as cited many times in previous sections, is probably the most elaborate study ever accomplished in this field. Aside from the nature and extent of the problems, the study also attempted to analyze the effects of anemia on physical endurance and productivity.

The outcomes of the study are that there is a correlation between hemoglobin levels and physical endurance as measured by the Harvard Step Test (HST)[1] (Figure 5) as well as between hemoglobin levels and productivity. The output of latex tapped by the anemic tappers was 19 percent lower than the non-anemics (Table 21). The anemic weeders performed a smaller area of excavation than the non-anemic weeders (Figure 6). As the tappers are paid according to the amount of latex produced, there is a linear correlation between the hemoglobin levels and the amount of money received by the workers (Figure 7).

The author was actively involved in this study, and he observed that the anemic workers were usually considered "lazy" or "weak" by the foremen, and classified as "unproductive" workers. This unfortunate group was often then assigned to unproductive or lower-yielding trees and were of course paid less. Thus the poor nutrition-income cycle is reinforced by this system.

1/ HST is a test that measures overall cardio-respiratory reserves, by having the subject step up and down from a platform 20 inches high, 30 times per minute for 5 minutes, unless he stops from exhaustion before the test ends.

Table 20. PERCENT PREVALENCE OF INFECTIONS IN IRON AND PLACEBO SUBGROUPS BEFORE (PRE-IP) AND AFTER (POST-IP) TREATMENTS (Plantation Sites)

	Anemic				Non-anemic			
	Iron Treatment (58)[a]		Placebo Treatment (56)		Iron Treatment (59)		Placebo Treatment (60)	
Disease	PRE-IP	POST-IP	PRE-IP	POST-IP	PRE-IP	POST-IP	PRE-IP	POST-I
Influenza	15.5	5.2	7.1	9.6	-	-	3.3	3.3
Common Cold	3.4	-	3.4	1.7	5.1	-	3.3	1.7
Bronchitis	-	-	1.8	1.8	-	-	-	-
Tuberculosis	-	-	3.4	3.4	-	-	-	-
Tonsilitis	3.4	3.4	-	-	-	-	-	-
Enteritis[b]	6.6	1.8	5.1	3.4	5.1	1.7	4.0	3.2
Gastritis	31.0	20.7	10.4	30.4	28.8	22.0	20.0	25.0
Susp. Liver Disease	-	-	-	-	-	-	-	1.7
Conjunctivitis	3.4	-	1.7	5.1	-	-	8.5	8.3
Pyodermia (fever)	-	-	3.4	10.0	-	-	5.1	5.1

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[a] Numbers in parentheses indicate sample sizes.

[b] Enteritis and gastritis denote diarrhea, gas, and pain, in lower and upper half of abdomen, respectively.

Source: Basta, 1974b.

Figure 5 . : RELATIONSHIP BETWEEN HAEMOGLOBIN LEVELS AND HARVARD STEP TEST (HST)
SOURCE :KARYADI,1973b

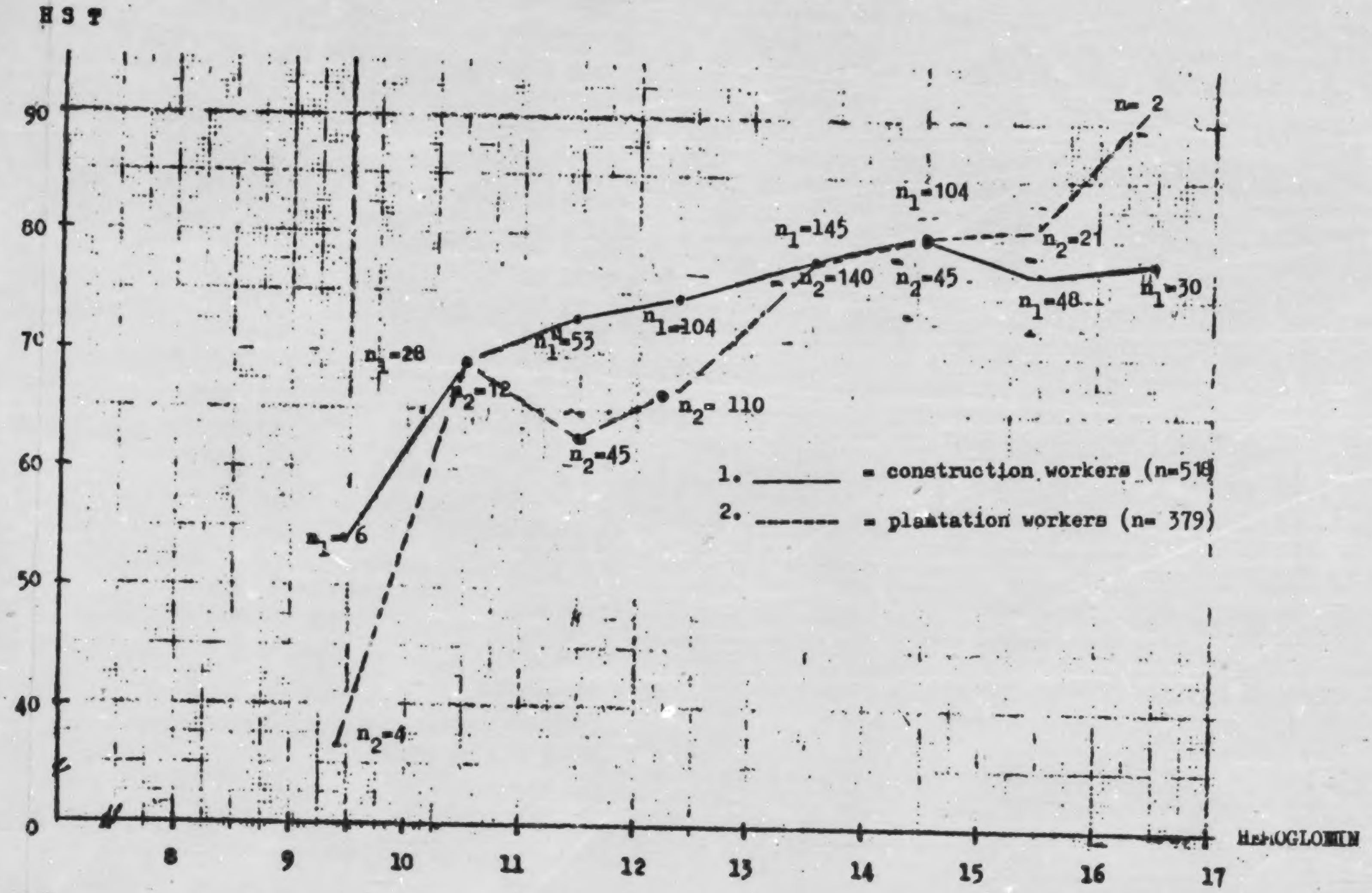


Table 21. DIFFERENCES IN LATEX OUTPUT AMONG ANEMIC AND NON-ANEMIC GROUPS BEFORE (PRE-IP) AND AFTER (POST-IP) TREATMENTS (MEAN ± S.D.)

	N	Output (kg.) PRE-IP	Output (kg.) POST-IP	Percent Increase in Output	Percent Difference (iron/placebo)
Anemic (Iron)	19	21.93 ± 7.41	29.78 ± 8.47	35.7	8.1 ($p < 0.05$)
Anemic (Placebo)	23	19.94 ± 8.31	25.46 ± 10.88	27.6	
Non-anemic (Iron)	20	24.64 ± 10.71	30.32 ± 13.46	23.0	1.3 (N.S.)
Non-anemic (Placebo)	15	26.90 ± 8.38	32.47 ± 11.68	24.3	

Note: Difference in output of anemic groups as compared to non-anemic groups before treatment (PRE-IP) are 18.6% ($p < 0.01$).

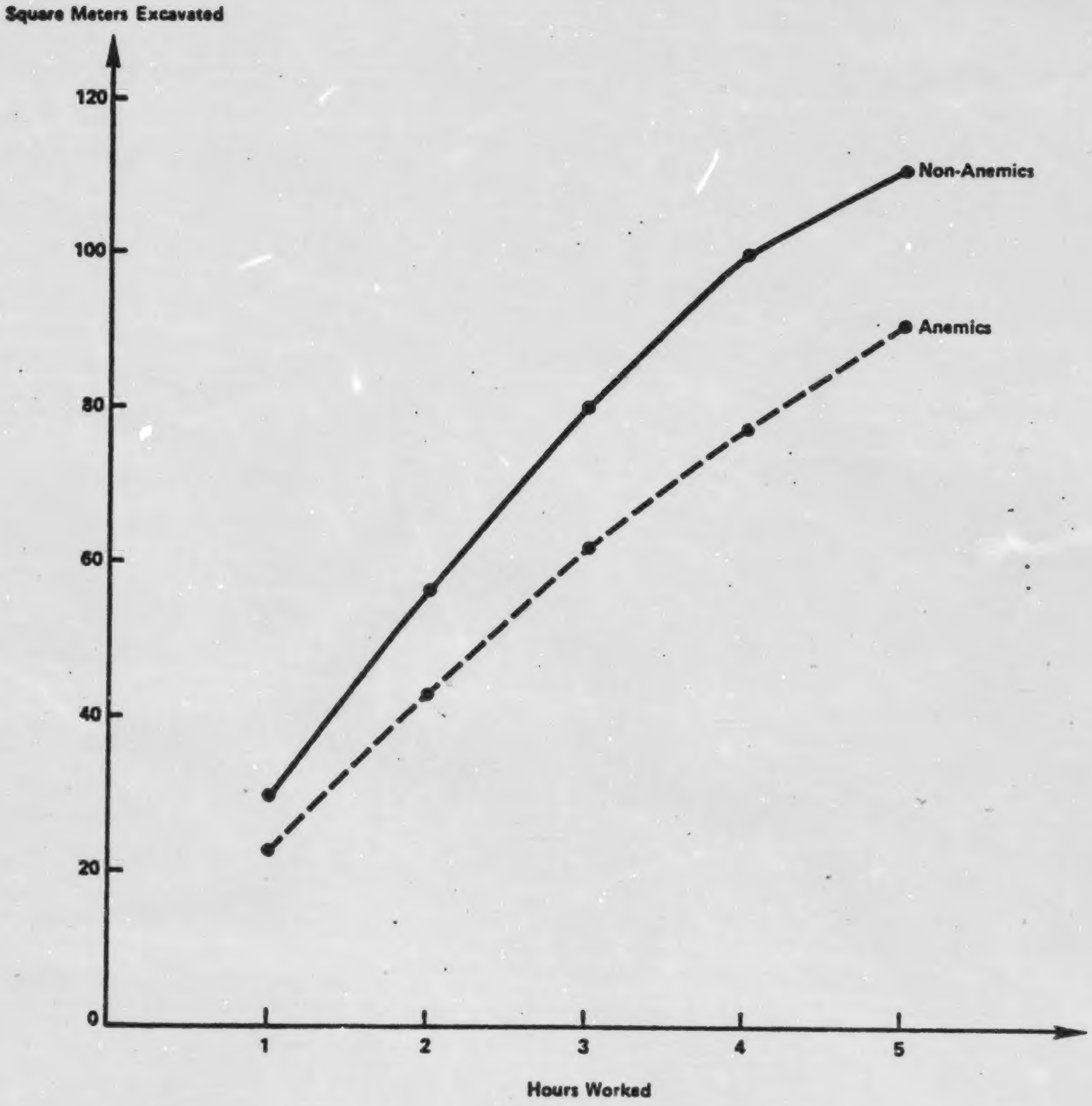
There is no significant difference in output between the iron treated anemic group and the iron treated non-anemic group after treatment (POST-IP).

Treatment with 100 mg. ferrous sulfate daily for 60 days.

Source: Basta, 1974a.

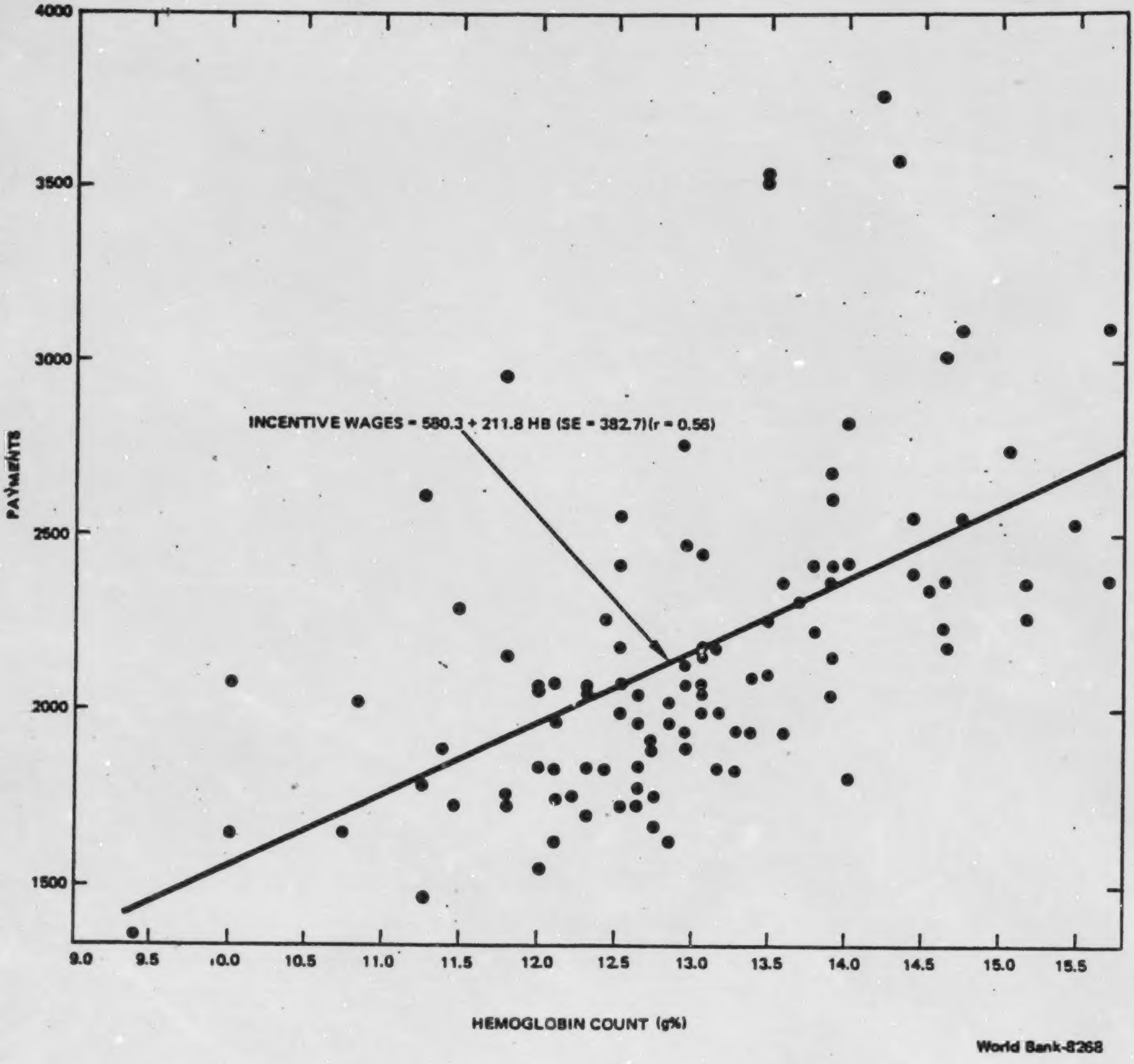
Figure 6. DAILY WORK OUTPUT (WEEDING) FOR ANEMIC AND NON-ANEMIC SUBJECTS.

REPRODUCED FROM : BASTA, 1974b.



Note: Each point or hour represents the cumulative mean for 46 observations in the non-anemic grup and 15 observations for the anemic group.

Figure 7. HAEMOGLOBIN VS LATEX MONTHLY INCENTIVE PAYMENTS REPRODUCED FROM : BASTA, 1974b.



World Bank-8268

Goitre

The world prevalence and geographical distribution of endemic goitre has been documented in the World Health Organization Monograph No. 44 in 1960 by Clements et al. (WHO, 1960). Kelly and Snedden's review on the prevalence of goitre in Indonesia was only based on the 24 pre-war publications (Kelly, 1960). No data were available for the years in the 1950's. Only one publication appeared in the 1960's (Soewondo, 1966). For two decades since independence, goitre had been the most neglected nutrition problem in Indonesia.

There are several reasons for this neglect: (i) Most of the interest in the other nutrition problems in Indonesia started in the big hospitals, particularly in Jakarta. Goitre is unlikely to be frequently observed in Jakarta[1/] and does not often result in hospitalization; (ii) As goitre seems not to cause dramatic suffering and death, cases which appear in small cities and rural areas are not likely to attract the attention of the local health authorities. Thus, no pressure from the periphery to tackle this problem is encountered in Jakarta, where most of the important research is concentrated; (iii) As the people most afflicted by goitre live in remote areas, a more complicated management and logistic problem exists if nutrition surveys are to be undertaken in those areas; whereas the surveys on PCM, xerophthalmia and anemia can be conducted almost anywhere in the country as the budget allows; (iv) There is little international "pressure" to consider goitre as an important problem, despite the high prevalence found in many countries as documented by WHO. Nevertheless, goitre is of public health importance and surveys of its prevalence are quite simple to conduct.

Recent attention to goitre began in Indonesia in 1972 when a relatively large-scale survey completed by Djumadias et al. revealed that goitre is prevalent among school children (Nain, 1973). A smaller survey was also undertaken by Gunawan and van Rhijn in West Irian in 1971 (Gunawan, 1971).

In his report in 1970, Van Veen also emphasized that more serious attention should, as soon as possible, be given to goitre problems in Indonesia. He had the impression that the incidence of goitre in Indonesia was on the increase (Van Veen, 1970).

Prevalence

As quoted by Kelly and Snedden, goitre has been existing in Indonesia probably for centuries. The existing superstitions about goitre in Java and Bali indicate that the disease has been prevalent in those areas (Kelly, 1960). In Gayo-Alas valley, the central part of Aceh Province, there is a folklore that those who have goitre are the heritage of the ancient kingdom of this area. This conforms with the high incidence of 80 percent in women and 60 percent in men in this area, as noted by Kelly and Snedden.

[1/] A study conducted in East Java by Soewondo et al. in 1966 was due to the frequent admission of patients with large goitre in the hospitals in Kediri (small town) and Surabaya (Soewondo, 1966).

A similar situation has been reported in the areas which might be called the "goitrous belt" of the Indonesian archipelago, namely: Sumatra, Java, Bali, Timur, West Irian, Sulawesi and Kalimantan (Kelly, 1960).

Iodized salt was introduced in 1927 in some areas in Java but without much follow-up after the war.[1]

In East Java, Soewondo et al. in 1966 found the prevalence of 25-97 percent in school children; most of them had goitre classified in the second group.[2] In 1934 in this area (the Kediri residency), then with a population of 1,600,000, there were 62,000 persons with large goitres, 4,000 with extremely large goitres, 12 cretins and about 2,000 with deaf-mutism. In some villages 80-100 percent of the school children had goitre (Soewondo, 1966).

In West Irian, Gunawan and van Rhijn reported an incidence of 18-63 percent (Gunawan, 1971).

The most recent surveys undertaken in 1972 by Djumadias et al. included a total of 6,703 school children from 39 villages in North Sumatra, West Sumatra, East Java and Bali, showed that 60-90 percent of them had goitre. These high percentages were found to be first and second grade goitre. None of them had a goitre of group 3. The nodular goitre, which was recorded separately, was seen in 0.1-3.5 percent of the children examined (Table 22) (Nain, 1973).

Table 22. PREVALENCE AND TYPE OF GOITRE AMONG SCHOOL CHILDREN IN INDONESIA

Province	n	Goitre (percent)	Type (percent)				Nodular (percent)
			0	1	2	3	
North Sumatra	1,783	62.1	37.9	51.3	10.2	0	0.6
West Sumatra	2,223	89.4	10.6	72.1	17.1	0	0.1
East Java	1,713	83.2	16.8	46.7	33.0	0	3.5
Bali	984	79.5	20.5	60.4	18.0	0	1.1

Source: Nain, 1973.

For a long time it had been thought that goitre was prevalent only in the mountainous areas. However data from Bali, where the prevalence in 1972 was 80 percent for 883 persons of all ages examined, suggests that sometimes goitre may also be found in the lowlands. In his visit to Bali in February 1973, Scrimshaw not only confirmed the existing prevalence of 51 and 61 percent, respectively, in two mountain villages of Catur and Sembirah, but also a prevalence of 9 percent for primary school children in the village of Lumbuan in the lowlands. Similarly, Scrimshaw in 1973 also found a prevalence of endemic goitre of 30 percent among 244 primary school children in the village of Imagiri, about 17 km. from Jogyakarta. From the follow-up studies in other areas of Jogyakarta Province, undertaken by Sarwoko and Persons, a prevalence of 30-80 percent was reported (Table 23) (M.I.T., 1974).

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[1] Brick-salt iodization produced by the Government Salt Works was discontinued in 1957, as people's salt producers began to operate.

[2] The WHO classifications: group 0 = normal; 1 = palpable goitre; 2 = visible goitres; 3 = very large goitres (Perez, 1960).

Table 23. PREVALENCE OF GOITRE AMONG THE SCHOOL CHILDREN, BY SEX

Regions/Country	Year	Boys		Girls		References
		n	Percent	n	Percent	
Indonesia:						
1. Kediri (E. Java)	1966	182	54.3	173	58.9	Soewondo,1966
2. North Sumatra	1972	874	59.8	909	65.2	Nain,1973
3. West Sumatra	1972	1,080	85.2	1,143	93.4	Ibid.
4. East Java	1972	950	82.6	763	85.2	Ibid.
5. Bali	1972	586	79.5	398	79.4	Ibid.
6. Jogyakarta						
- Kulon Progo	1973	1,585	31.0	1,450	37.9	Sarwoko and Persons[a]
- Bantul	1973	503	46.9	524	55.7	Ibid.
- Gunung Kidul	1973	967	47.8	810	50.4	Ibid.
- Sleman	1973	1,366	75.6	1,252	81.5	Ibid.
Total Indonesia		8.093	61.9	7,422	67.3	
Ukinga, Tanzania	1965	1,676	74.0	869	81.4	Latham,1965
West Pakistan[b]	1955	-	41.3	-	72.3	Kelly,1960, p. 156
Thailand	1958	2,856	32.3	2,816	40.6	Ibid., p. 164
Brazil	1943	850	38.6	712	44.8	Ibid., p. 57
U.S.A.[c] (Michigan and Wisconsin)	1924	-	40.0	-	60.0	Ibid., p. 34

[a] In M.I.T., 1974

[b] Total children examined = 319.

[c] Before iodized salt introduced, after the iodization, the rate dropped to 1.4% in 1951 among 53,785 school children examined.

The prevalence of goitre among the school children of Indonesia seems likely to be comparable to other goitrous countries as indicated by Kelly and Snedden, prior to their iodization programs.

There are no contemporary data on the prevalence of goitre in adults, except the one report from West Irian (Gunawan, 1971). However, the high prevalence among school children is a valid indicator of the magnitude of the problem in Indonesia. Evidence of goitre may sometimes disappear in adult males, but rarely in adult females, particularly if they bear children. Thus, even minor degrees of thyroid enlargement in young people may have severe sequelae in later life (Clements, 1960).

In addition, the prevalence of 10 percent or more among children of 7-15 years of age has been used as a warning for taking preventative measures (Matovinovic, 1960).[1]

Epidemiology

Among the nutrition problems, goitre is known to have the simplest type of host-agent-environment relationship (Follis, 1964). There are indigenous and exogenous factors responsible for the occurrence of goitre. The former refers to the non-nutritional factors, such as a congenital thyroid insufficiency; the latter are nutritional in nature, viz. iodine deficiency. In areas where goitre is sporadic, it may be due to the indigenous factors. In endemic areas, a deficiency of iodine in the diet and drinking water is the more important cause (Roche, 1960; Latham, 1970).

The role of goitrogens in the diet, such as cabbage which has been thought to be responsible for high prevalence of endemic goitre, inter alia, in Belgium (Kelly, 1960, p. 66) and in Ukinga, Tanzania (Latham, 1965) has never been reported in Indonesia. Though cassava has also been suspected as a goitrogen in Nigeria and in Eastern Congo (Stanbury, 1970), there is no evidence so far to show that the cassava areas in Indonesia are also endemic goitre regions. Most of the reports cited by Kelly and Snedden concerning Indonesia emphasized the deficiency of iodine in the environment (air, water, soil) in the "goitrous belt" areas. The importance of these so-called "goitrogens" for the human is in doubt.

Infections, malnutrition and poverty, to a certain extent, might play a role in the onset of goitre, as observed in the Himalayan areas of India (Roche, 1960, p. 364) and also in Bali (Kelly, 1960, p. 170). Two villages in Bali, namely Catur and Lampoe, have different characteristics in relation to goitre. Catur is inhabited by pure Balinese and goitre is common; Lampoe is a Chinese settlement and is free from goitre. The Balinese have a monotonous maize and rice diet whereas the Chinese have a varied diet.

However, there is little evidence to support those views. More information is needed for Indonesia. This can be obtained if any clinical-nutrition survey were to provide more attention to goitre. Nevertheless, within the present state of knowledge, the primary importance of iodine deficiency in goitre cannot be denied, whatever its mode of action (Roche, 1960, p. 366).

Public Health Significance

Aesthetic Disadvantage

Endemic goitre in the early stage in which there is no great enlargement of the thyroid gland may cause no symptoms. Prompt treatment will prevent both further enlargement and complications, and in many cases will cause the gland to return to its normal size. Untreated goitre may enlarge to a visible stage which is an aesthetic or cosmetic problem. Further enlargement, however, may cause difficulty in breathing, persistent cough and voice change. Carcinoma of the thyroid is more common in those with goitre (Latham, 1970).

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[1] In a seminar on Goitre Control, WHO, New Delhi 1967, the prevalence level calling for preventive action was set at 30 percent (Nain, 1973).

Cretinism and Deaf-Mutism

Iodine deficiency may cause endemic cretinism, though it is still unclear what influences its occurrence. It is clear that endemic cretinism only occurs in those parts of the world where goitre is endemic, but it appears that the reverse is not always true (Nutrition Review, 1971).

Cretinism and deaf-mutism had been reported as being common in the "goitrous belt" of Sumatra and East Java before the war (Kelly, 1960, p. 168). Clements et al. pointed out the evidence that the high prevalence of goitre in pregnant women leads to an increased frequency of infants predisposed to mental retardation, deaf-mutism and cretinism (Clements, 1960, p. 245).

Thus, the public health impact of goitre is very substantial, a fact that is rarely appreciated in Indonesia. Because of the fact that goitre is prevalent among school children, particularly in girls, it is clear that goitre is a serious public health problem like PCM, xerophthalmia and anemia. If people are concerned about the possible bad effects of PCM upon mental development, why are they not concerned about goitre, given that millions of people in Indonesia are living in remote areas subject to iodine deficiency and the clear evidence that cretinism, mental retardation and deaf-mutism occur in infants of iodine-deficient mothers. Thus, although we do not have good evidence on the prevalence either of goitre or endemic cretinism in Indonesia, there is no doubt that it is a problem which should be attacked. This is all the more so because its prevention is both feasible and relatively cheap.

FOOD PRODUCTION AND SUPPLY

The Role of Agriculture

As in many developing countries, agriculture is the most important sector in Indonesia's economy. Almost 50 percent of the national income is contributed by this sector (Table 24). Until 1970/1971 the composition of exports was still dominated by agricultural commodities, but it is now likely that petroleum will take their place (Table 25).

In addition, more than 60 percent of the population earn their living from agriculture (Table 26). Therefore, the agricultural sector has been chosen as the leading sector in the Five Year Development Plan of Indonesia. Agricultural development as the backbone of national development for a country like Indonesia, with a population of more than 120 million, is not only commendable in itself (Mellor, 1970); it is also a strategy which is closely linked with a national nutrition improvement program (Lele, 1971; Lele, 1972).

Table 24. GROSS NATIONAL PRODUCT, 1939-1973
(Percent)

Sector	1939	1960	1968	1973
1. Agriculture	61.0	53.9	52.0	40.2
2. Industry	15.0	8.4	9.0	9.8
3. Mining	-	3.7	3.8	9.2
4. Others	15.0	34.0	35.2	40.8a/

a/ Communications, constructions, electricity, gas, trade and services.

Source: 1939, Mubyarto, Pengantar Ekonomi Pertanian, (An Introduction to Agricultural Economics), Jakarta, 1972, pp. 14.
1960, 1968, Central Bureau of Stat., Stat. Pocket Book, Indonesia, 1970/71.
1973, Draft Pelita-II, 1974/75 - 1978/79, Vol. 1, pp. 6-5.

Table 25. EXPORT COMPOSITION, 1928-1973 (Value in percent)

Year	Agriculture	Othersa/ (excluding petroleum)	Petroleum	Total
1928	79	-	-	-
1938	65	10	25	100
1950-1959	58	27	25	100
1960-1969	49	17	34	100
During "Pelita-I"				
1969/70	46	17	37	100
1970/71	41	22	37	100
1971/72	33	24	43	100
1972/73	25	25	50	100
1973/74	21	29	50	100

a/ Including timber.

Source: 1928 - 1969, Mubyarto, op. cit., p. 15.
1969/70 - 1973/74, Draft Pelita-II 1974/75 - 1978/79, Vol. 1, pp. 9-6.

Table 26. AGRICULTURAL AND NON-AGRICULTURAL POPULATION, INDONESIA, 1930-1973 (percent)

	1930	1961	1973/74
Non-agriculture	23.9	26.2	29.7
Agriculture	67.7	71.9	60.3
Unknown	8.4	1.9	0.0
Total	100.0	100.0	100.0

Source: 1930, 1961, Widjojo Nitisastro, Population Trend in Indonesia, Cornell University Press, 1970, pp. 84 and 188.
1973/74, Draft Pelita-II, op. cit., pp. 6-7.

Past and Present Food Situation

Food production and availability in Indonesia has been one of the serious problems since independence. This situation was anticipated by Postmus and Van Veen in 1949 (Postmus, 1949). In his recent review on the food and nutrition situation in Indonesia in 1970, Van Veen as an FAO consultant discussed the extent of the seriousness of these problems (Van Veen, 1970).

There are several reasons for the existing food problems in Indonesia:

(i) Food production does not keep up with the population growth.
As can be noted from Table 27 and Figures 8 and 9, prior to the First Five-Year Development Plan ("Pelita-I") per capita food production declined, except for maize. The latter was due to the campaign launched by the old government in 1962-1964 to compensate for the rice crisis and the favorable international market for export. In addition the introduction of high yield maize varieties in 1963 increased the production to 5 or 6 times that of the local varieties (Department of Information, 1969).

During the "Pelita-I", however, only rice production increased above the rate of population growth and left the other food commodities behind. This is a result of the rice policy adopted by the government, which will be discussed later.

(ii) The accelerating demand for rice.
The average Indonesian household expenditure on food represents 76 percent of the total expenditure (Table 28). Forty to fifty percent of this is spent on rice (and corn).1/ As the expenditure elasticity of demand for rice on the average is 0.65 with a wide range of 0.2 to 1.45 for the highest and the lowest income groups, respectively (Timmer, 1971), it could be expected that the demand for rice is accelerating with the growing population, better income and favorable price policy. Since production is not sufficient, ever increasing rice imports are unavoidable.

1/ In the urban and rural West Java and most of the outside Java, mainly rice.

Table 27. POPULATION AND FOOD PRODUCTION TRENDS BEFORE AND DURING "PELITA-I", 1960-1972 (1960 = 100)

Year	Rice	Corn	Cassava	Sweet Potato	Peanuts	Soybean	Population
1960	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1961	94.3	92.8	98.3	92.2	98.4	96.2	102.2
1962	101.4	131.8	100.0	138.6	101.9	89.6	104.4
1963	90.6	95.8	103.5	116.8	91.8	79.0	106.5
1964	96.0	153.2	107.8	148.2	101.9	88.5	108.8
1965	101.2	96.1	111.1	99.3	95.3	92.5	111.1
1966	106.5	151.1	98.7	92.7	102.7	94.1	113.3
1967	103.2	96.3	94.5	80.3	94.1	83.9	115.7
1968	115.9	128.7	99.8	88.5	112.1	94.8	118.1
Pelita-I:							
1969	121.4	93.2	95.9	84.6	104.3	87.8	120.6
1970	138.8	114.8	92.1	81.4	109.0	112.4	123.1
1971[a]	143.2[b]	106.9	88.3	80.7	109.4	107.2	125.6
1972	140.1[b]	113.8	92.3	82.4	119.1	107.2	129.0

[a] Preliminary figures.

[b] Corrected figures; the original figures were 145.6 (1971) and 153.7 (1972); the corrections taken from Draft "Pelita-II", 1974.

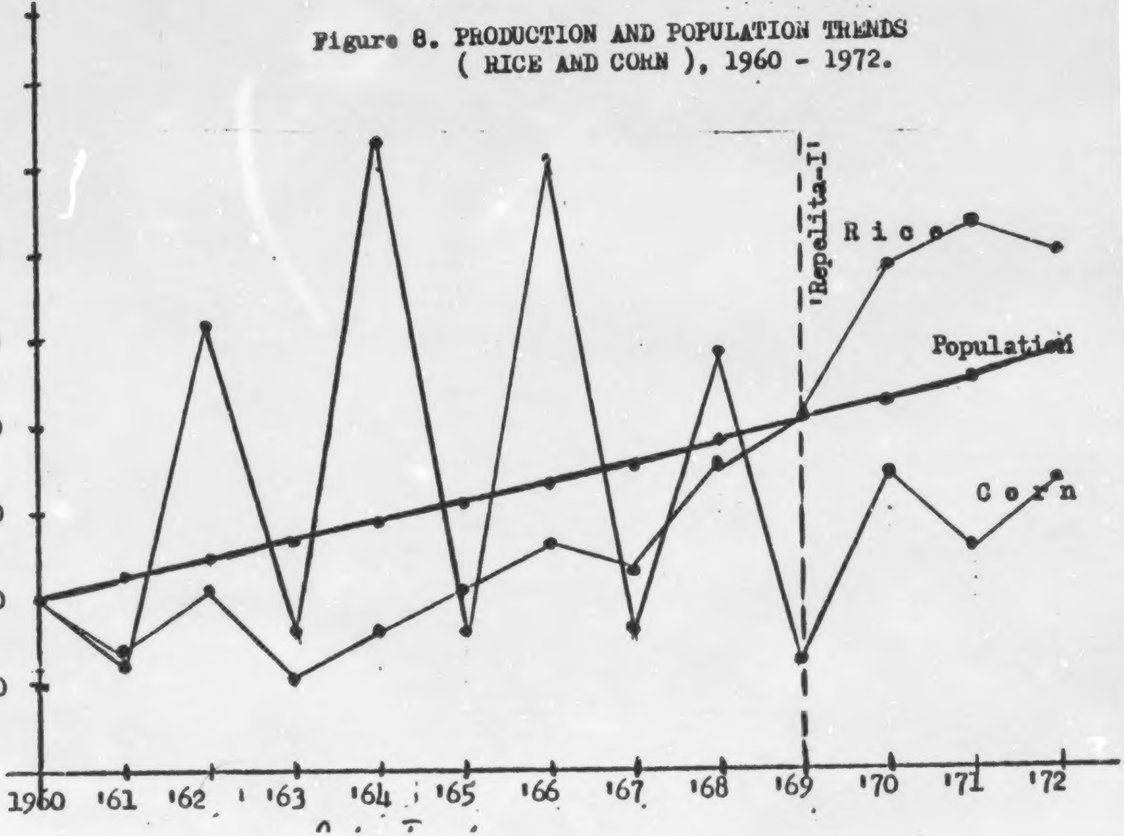
Source: Department of Agriculture, "Raker Ditjen Pertanian Tentang: Produksi Padi, Palawija dan Hortikultura," ("Official Conference on Rice, Second Crops and Horticulture Production") Oct. 1972, Unpublished doc.

Rice imports represent an annual average drain of about 25 percent of the foreign exchange supplies in the 1960's (Ismael, 1970). Although this figure declined relatively during the "Pelita-I" (Table 29), the total amount of rice imported increased. It seems that Indonesia is the biggest rice importer in the world (Table 30).

(iii) The food production and supply do not meet the Recommended Dietary Allowances (RDA) for the average Indonesian.

Van Veen calculated that the average per capita per day calorie and protein provided by food production in 1968 was only 1,588 Calories and 35 grams protein, or about 70 percent of the RDA. However, there were great variations between regions, ranging from 1,075 Calories in Jogyakarta to 2,085 Calories in Sulawesi and 22.5 grams protein in East Kalimantan to 46.5 grams in West Nusatenggara (Figures 10 and 11) (Van Veen, 1970).

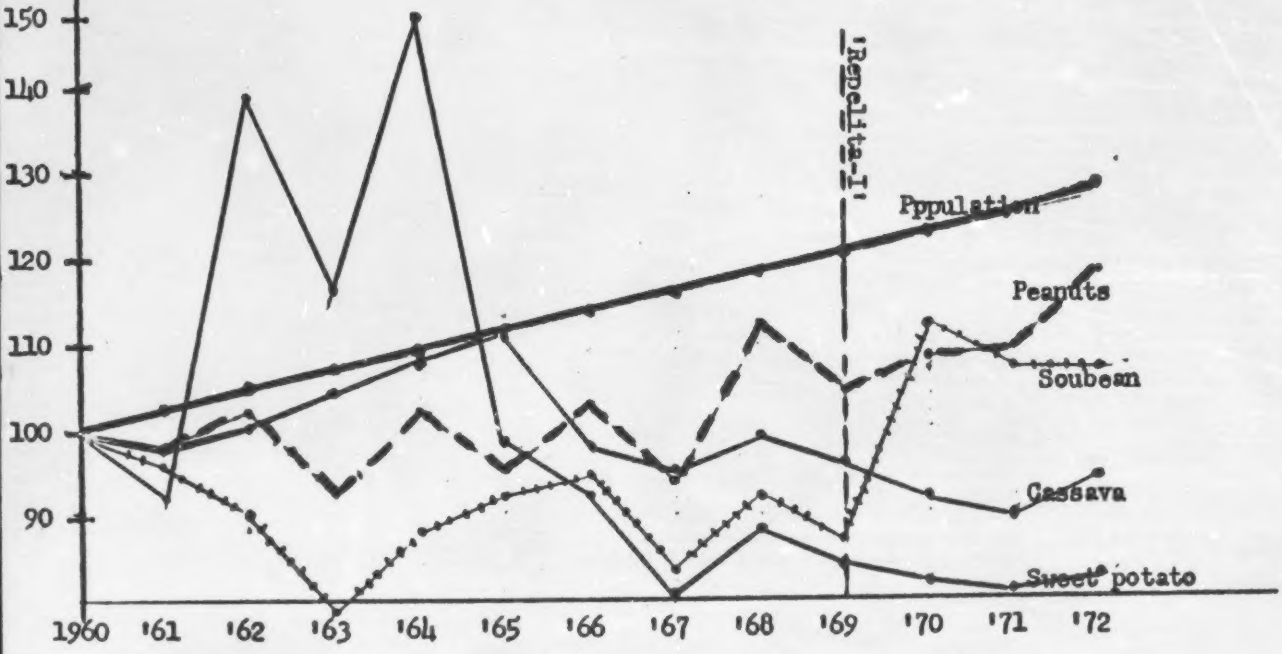
Figure 8. PRODUCTION AND POPULATION TRENDS (RICE AND CORN), 1960 - 1972.



Note : Corn production in even years show higher than odd years, because the rain fall has delayed, so were the planting seasons. Thus the harvest always fell in even years.

SOURCE : DEPARTMENT OF AGRICULTURE, 1972, op.cit.

Figure 9. PRODUCTION AND POPULATION TRENDS
(CASSAVA, SWEET POTATO, PEANUT, SOYBEAN)
1960 - 1972



SOURCE : DEPARTMENT OF AGRICULTURE, 1972,op.cit.

Table 28. PERCENTAGE AND AMOUNT OF HOUSEHOLDS EXPENDITURE ON FOOD BY INCOME LEVELS AND AREAS, JAVA, 1969

	Rural[a]		Urban[a]		
	Poor	Better Off	Poor	Better Off	Average Households
Food from total expenditure (%)	81	78	75	69	76
Food commodities from total food expenditure (%):					
1. Rice + Corn[b]	52	44	50	32	42
2. Tubers	9	4	3	1	5
3. Rice + Corn + Tubers	61	48	53	33	47
4. Legumes	3	3	4	4	4
5. Fish	5	7	4	5	7
6. Meat + Eggs + Milk	1	5	4	14	6
7. Prepared Foods	1	4	6	8	4
Food expenditure in Rupiah[c] per caput per month (Rp.)	556	1,306	749	1,888	978
Food expenditure in kilogram rice equivalent per caput per year (kg.)	133.4	313.4	179.7	453.1	234.7

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[a] Poverty line is set at the per caput annual income equivalent of less than 240 kg. milled rice for rural households and less than 360 kg. for urban households. Better Off = above the poverty line.

[b] In urban areas of Java and rural areas of West Java, mostly rice.

[c] $1.00 = Rp. 410

Source: Sajogyo, 1974; compiled from "SUSENAS", 1969, Central Bureau Statistics, Jakarta.

Table 29. IMPORT VALUE WITHOUT PETROLEUM DURING "PELITA-I" 1969-1974 (in Million U.S. Dollars)[a]

	1969/70	1970/71	1971/72	1972/73	1973/74
I. Consumption Goods:					
1. Foods:	224 (21.7%)	171 (14.2%)	134 (12.4%)	250 (15.5%)	685 (23.7%)
Rice	147 (14.2%)	103 (8.5%)	96 (8.9%)	209 (12.9%)	504 (17.4%)
Wheat flour	55	50	38	-	2
Sugar	16	15	-	21	72
Others	6	3	-	20	107
2. Non-foods:	364	347	263	467	991
II. Raw Materials/ Components	336	426	446	642	892
III. Capital Goods	301	432	370	508	1,006
Total	1,031	1,205	1,079	1,617	2,889

a/ Percentage in the brackets are of the total imports.
Source: Draft "Pelita-II", 1974/75 - 1978/79, Vol. I, pp. 9-6.

Table 30. PRINCIPAL RICE IMPORTING COUNTRIES (thousand tons)

Country	1964-1966 (average)	1970	1980 (projected)
1. Indonesia	491	725[a]	885
2. Rep. of Korea	-	540	575
3. Ceylon	664	510	480
4. Hongkong	344	380	420
5. Singapore	166	230	195
6. India	734	177	-
7. Rep. of Vietnam	185	650	-
8. Japan	764	-	-
9. Senegal	174	180	155
10. Cuba	272	170	80

a/ In 1972/73, after the long drought, a rice import of 1.5 million tons was planned, 50% from food aid, and 50% as commercial imports with a value of more than $100 million (Bull. Indon. Econ. St. 9: 3, 1973).
Source: FAO, 1971, "Agricultural Commodities Projection 1970-1980," Vol. I, p. 110.

Figure 10 : CALORIE PER CAPUT PER DAY FROM
6 MAIN FOODS (PRODUCTION 1968)
REPRODUCED FROM : V.VEEN, 1970.

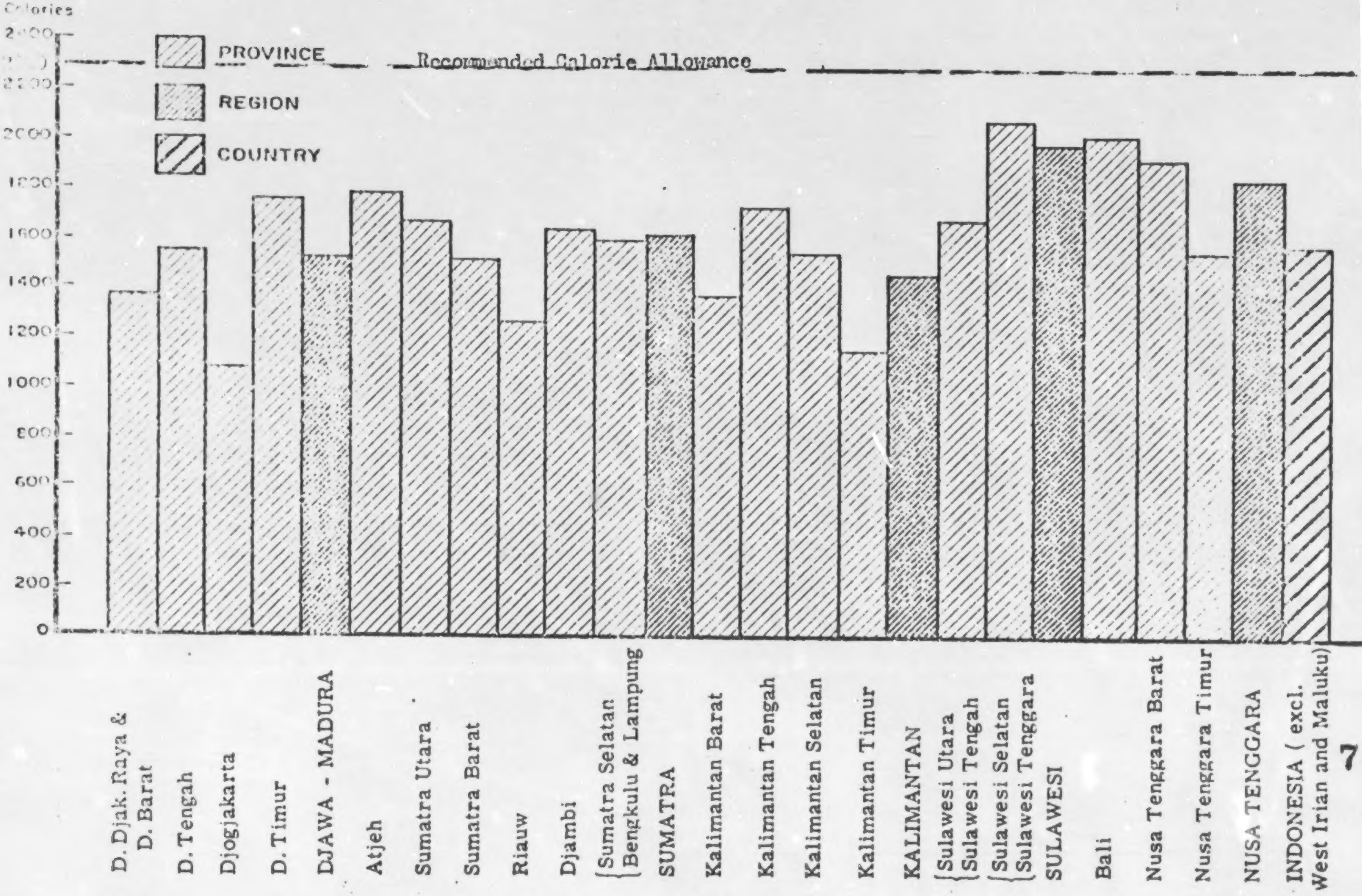
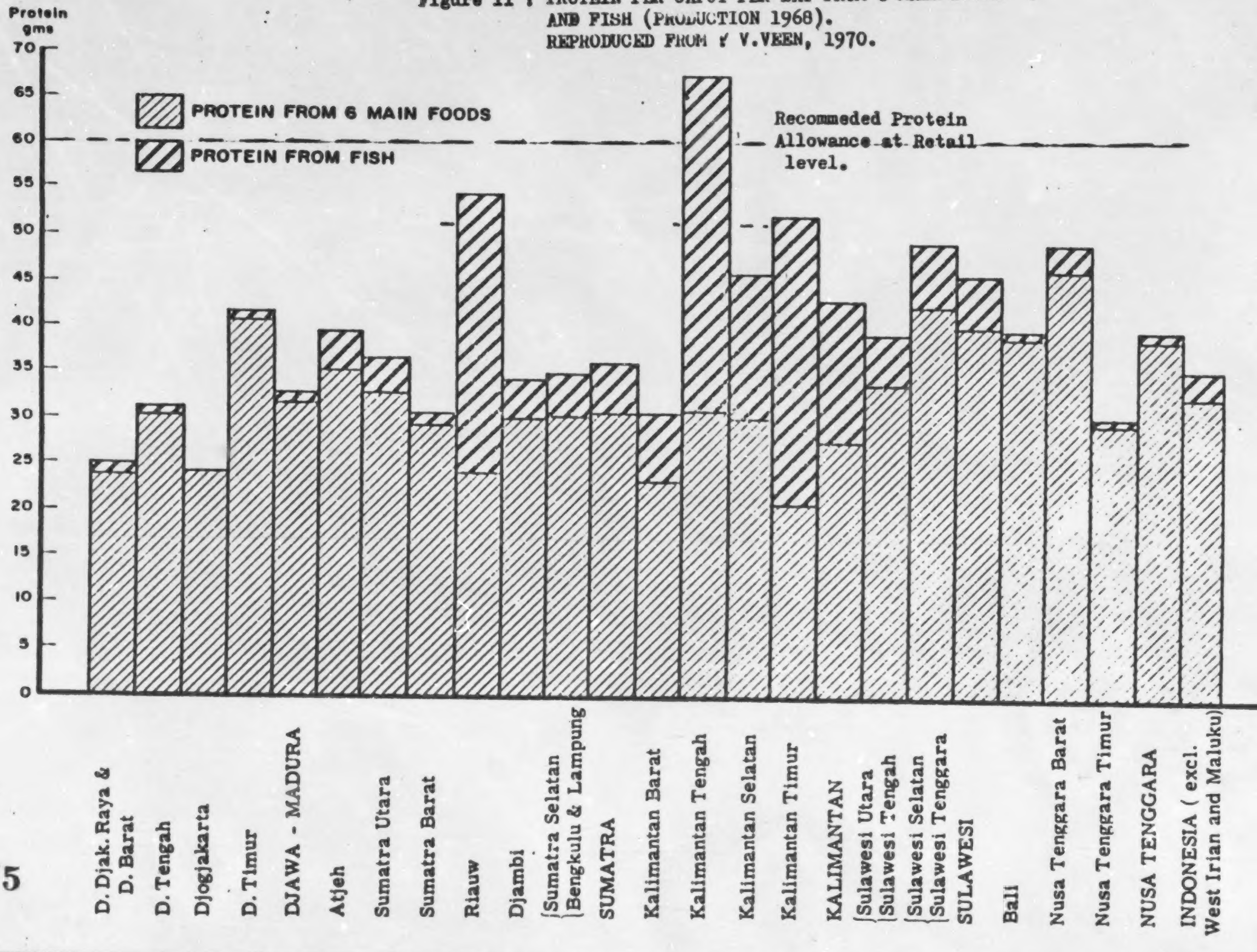


Figure 11 : PROTEIN PER CAPUT PER DAY FROM 6 MAIN FOODS AND FISH (PRODUCTION 1968).
REPRODUCED FROM : V.VEEN, 1970.



Although the average per capita per day supply from 1966-1971 (Table 31) indicate calorie and protein availability close to the RDA, one should keep in mind the skewness of the distribution in certain regions (as suggested by Van Veen) as well as in certain groups of the population. Thus it may be deceptive to rely on the average figures for a country like Indonesia. This is particularly true if one intends to use the data to analyze the existing nutrition problems. However, average figures below the recommended average should indicate that the situation warrants very serious attention.

Table 31. BASIC FOOD SUPPLY, PER CAPITA, 1964-1971[a]

Commodities	Per Year (kg.) 1964-1968	Per Year (kg.) 1969-1970	Per Year (kg.) 1970-1971	Per Day (g.) 1964-1968	Per Day (g.) 1969-1970	Per Day (g.) 1970-1971	RDA
1. Rice	84.64	96.36	117.00	232	264	321	
2. Wheat Flour[b]	1.17	2.77	3.60	3	4	9	
3. Corn	26.44	21.53[c]	27.20	72	59	75	
4. Tubers	115.71	105.58	94.80	317	290	246	
5. Pulses	5.75	6.09[c]	5.80	15	17	17	
6. Fish (sea + land)[d]	9.87	10.90	10.40	27	30	30	
CALORIE	-	-	-	1580	1571	1841	(2300)
PROTEIN (g)	-	-	-	39.1	35.4	44.8	(60)
FAO Estimates for Indicative World Plan from 15 groups of food commodities (1960-1966)[e]:							
Calorie				1693-1884	1779-1926	-	
Protein				39.2-43.7	40.5-43.8	-	

---

a/ Supply = production - (seeds + export) + imports, except commodities with note.

b/ Central Bureau Statistics, "Statistical Pocket Book Indonesia," 1970/71.

c/ Included for export.

d/ Department of Agriculture, "Review of Progress in Agricultural Sector: 1971-1972," Jakarta 43/Bprc/Doc/XI/72 (including for export)

e/ FAO/IWP by Commodity Analysis Group for Indonesia, quoted by D. D. Prawiranegara, "Production and Consumption of Legumes in Indonesia," First Asian Workshop on Grain Legumes, 1974.

Source: (except where noted):

- 1964-1968, Department of Agriculture, "Raker Dirjen Pertanian," October, 1972.
- 1969/70, J. F. De Wijn, 1972, "Assignment Report on ANP Indonesia," WHO Project: IND.0125, 1972/WHO-SEA 72/2222, p. 18.
- RDA, Workshop on Food NAS-LIPI Recommended Dietary Allowances for Indonesia at retail level (NAS-LIPI, 1968).

Thus, the development strategy built around agriculture with the focus on increasing food production corresponds to the urgent need of the majority of people. As the outcome of the "Pelita-I" for food commodities as a whole was only moderately successful (Table 32), some of the policies should probably be reformulated, notably perhaps the rice policy.

Rice Policy in the "Pelita-I"

In the years prior to the "Pelita-I", Indonesia suffered from economic and political unrest. Rice has proved to be the measuring rod for the prices of many basic commodities (Ismael, 1970), hence it has a significant impact on political stability. This latter may be a prerequisite for national development. Thus, a high priority was given to the availability of rice in the country by means of increasing production and imports. It was hoped that the rice imports would go down as the domestic production increased. As demonstrated, that did not prove to be the case.

In the "Pelita-I" it was hoped that an annual increase of 9.4 percent of rice production could be achieved, viz. from 10.52 million tons in 1968/69 to 15.4 million tons in 1973/74. Van Veen in his report commented on the very high target set and noted that the average annual increase in rice production between 1953-1967 was only 1.5 percent for the country as a whole (Van Veen, 1970).

Table 32. PRODUCTION TARGETS, PRODUCTION PERFORMANCE, 1971, AND NATIONAL FOOD ALLOWANCES

Foods	National Food Allowances 1973/74	Production Target 1973/74	Production Performance 1971
	(million tons/year)		
Rice	15.79	15.42	13.72
Corn	2.96	4.23[a]	2.63
Roots, Tubers	9.77	18.09	12.20
Legumes, Pulses	2.11	1.40[a]	0.81
Fruits, Vegetables	12.90	11.20[a]	8.16
Fish	3.87	1.97	1.22
Meats, Poultry	1.06	0.11	n.a.
Eggs	0.29	0.02	n.a.
Milk	0.29	0.01	n.a.
Sugar	1.34	0.91	0.34
Fats, Oils	1.06	?	n.a.

n.a. data not available.

[a] Includes exports.

Source: Allowances, Targets: A. G. Van Veen, 1970, Report to the Government of Indonesia, FAO, Rome, based on Workshop on Food, 1968, with estimated population of 131 million in 1973/74.
Performance: Department of Agriculture, "Review of Progress in Agricultural Sector 1971-72," unpublished doc., 43/Bprc/Doc./XI/72

Table 33 shows that between 1968-1971 the annual increase in rice production was 4.4-7.2 percent. There was a set-back in 1972 due to the long drought; thus the overall rate of increase in production averaged only 4.2 percent. Although the performance was lower than the target, it exceeded the rate of population growth (2.4 percent). Thus, there is a real per capita increase.

Table 33. AREA HARVESTED, PRODUCTION AND YIELD OF RICE DURING "PELITA-I", 1968-1973

Year	Area Harvested (1,000 ha)	Production[a] (1,000 tons)	Yield (100 kgs/ha)
1968	8,020	11,666	12.68
1969	8,014	12,249	13.23
1970	8,135	13,140	14.66
1971	8,317	13,724	16.59
1972[b]	7,984	13,305	16.69
1973[c]	8,388	14,455	17.23

a/ Revised figures.
b/ Temporary figures.
c/ Estimated figures.
Source: Draft Pelita-II 1974/75-1978/79, Vol. IIA, pp. 10-2.

The increase in rice production had been accomplished by the extension of the area harvested as well as the adoption of a new technology to increase the yield. The total area harvested increased from 8,020,000 ha. in 1968 to 8,388,000 in 1973 or a total increase of 4.6 percent. The yield per hectare increased 35.9 percent, from 1,268 kg. in 1968 to 1,723 kg. in 1973. This provided a rising income for the rice farmers (Table 33).

Along with production goals, rice policy succeeded in stabilizing rice prices which provided an incentive for farmers and for consumers. This program was carried out with the government's major domestic purchase operation through "BULOG" (a government's logistic institution) and rice imports.

On the whole, the success of the rice policy had been achieved through the government's price support coupled with the inputs subsidy and a large-scale production credit program; of course a better infrastructure was also a contributing factor. The fact that this policy has its disadvantages is understandable (Mellor, 1970, p. 208; Mellor, 1972).

From the economic point of view, the rice policy is a burden on the government's budget. A drain on the limited foreign exchange resources because of the importation of rice has long been one of the problems of Indonesia. The managerial, administrative, and budgetary problems in maintaining the mechanism of price stabilization are further problems.

An almost universal side effect of the green revolution is also encountered in Indonesia. As elsewhere, it is evident that the rice policy benefitted mainly the better off farmers. The poor, namely the laborers, small holders, landless and non-rice farmers were left behind (LEKNAS, 1972;

Sajogya, 1974). This income disparity is also reflected in the food consumption patterns of those groups (see next section).

From the nutrition point of view, the rice policy tends to undermine or make more difficult sound nutrition education. The already established negative attitudes of Indonesian people toward the domestic rice substitutes, namely corn, cassava and sago, are unconsciously reinforced by this rice policy. As these rice substitutes used to be a part of the diet of rural people in certain areas of Indonesia, the "advocated" shift of diet patterns to more rice is a consequence of the rice policy. Thus it appears that the policy may be a "boomerang" for the government. The nutritional effects of this phenomenon are discussed in the next section.

FOOD CONSUMPTION PATTERNS

Data on food consumption in Indonesia are scarce. A periodical national nutrition survey, though long planned by the Indonesian Institute of Nutrition, has never materialized due to financial difficulties. Thus, in trying to appraise the food consumption patterns in Indonesia, one has to rely on the limited scattered data which are available.

Food consumption data form a part of the national socio-economic survey ("SUSENAS") of the Central Bureau of Statistics (CBS) which is available. Although their reliability is debatable the "SUSENAS" data are of great benefit.

Consumption Patterns in the Pre-War Period

The pre-war data collected by the old Institute of Nutrition Research indicated that in the 1930's (Postmus, 1949) average food intake in general was adequate, though the patterns varied by regions. In the prosperous areas of West Java (e.g. Pacet), the daily average per capita calorie and protein intakes were about 1,800-2,300 and 40-60 grams, respectively. The only serious deficiency disease frequently encountered in this area was vitamin A deficiency found among pre-school children. Because of cultural factors children often did not consume adequate quantities of vitamin A or carotene containing foods although green vegetables grew around them in abundance.

In the poor cassava areas of Gunung Kidul (Central Java), however, the daily per capita intake was only 1,100-1,300 calories and 22-36 grams protein. In these areas "hunger edema" due to calorie and protein deficiencies was endemic.

As can be noted from Table 34, the food consumption levels of Gunung Kidul in 1958-1959 were even lower. It was suggested by Postmus and Van Veen that this was because of population pressure and the diminishing fertility of the land.

In Ceram, East Indonesia, where the staple food is sago which is nutritionally similar to cassava, the above survey showed that in many respects the situation was similar to the cassava diet region of Gunung Kidul. However, in the Ceram sago-diet the calorie supply was sufficient and more animal protein from fish was consumed. No serious nutrition problems have been recorded from this area.

Table 34. FOOD CONSUMPTION PER CAPITA PER DAY OF PACET (WEST JAVA) AND GUNUNG KIDUL IN 1938-1939 and 1958-1959

Foodstuff	Pacet 1938-1939	Gunung Kidul 1938-1939	Gunung Kidul 1958-1959
	(grams)		
Rice	550	52	79
Corn	-	39	39
Cassava (dried)	15	256	239
Other tubers	-	5	-
Sorghum	-	3	-
Legumes	30	14	6
Animal products	37	2	-
Vegetables	20	100	36
Coconut	-	20	9
CALORIES	2,000	1,392	1,321
PROTEIN (g.)	51.5	18.3	15.3
FAT (g.)	8.8	13.8	6.8

Source: 1938-1939: S. Postmus and A. G. Van Veen, 1949, "Dietary Surveys in Java and East Indonesia," Chron. Nat. 105: 229-A.
1958-1959: K. V. Bailey, 1961, "Rural Nutrition Studies in Indonesia: Background to Nutritional Problems in the Cassava Areas," Trop. Geogr. Med. 13: 216-233.

The fact that the sago-diet regions, such as in Ceram and the Maluku Islands are on the whole[1] able to balance their diet adequately proves that rice is not a necessity for all the people of Indonesia. Unfortunately, probably due to the previously described rice policy, there is a tendency to shift from sago diets to rice-diet patterns even in this area. This trend was mentioned by the Maluku Governor in a press interview in March 1974.[2] He called for special attention from the central government to deal with the future production of sago which is abundantly produced in Maluku. This is another example of the "boomerang effect" of rice policy as discussed previously.

Recent Consumption Patterns

The most up-to-date data on food consumption in Indonesia are from the Applied Nutrition Programs (ANP) evaluation survey administered by Sajogyo et al. in December 1972 - February 1973 (Sajogyo, 1974). The overall picture of the food intake of rural people in the survey seems to confirm the extent of the nutrition problems depicted in the third section of this monograph.

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[1] With a population of 1,089,000 in 1971.

[2] In press: Sinar Harapan, "Penduduk Maluku Mulai Sadar Beras" (Maluku's people are beginning to be rice-minded"), March 30, 1974.

From the total sample of 1,053 households in 30 villages of 8 provinces in Indonesia,[1] the survey reveals that the average daily per capita intake was: 1,528 Calories, 42.8 grams protein, and 20 grams fat. Sixty-seven percent of the calorie and 51 percent of the protein was contributed by rice. The animal protein was 8.3 grams or 19 percent of the total daily protein.

The lowest average household consumption level was found in Java, viz. 1,404 Calories (49 percent from rice) and 37.8 grams protein (38 percent from rice and 12 percent animal origin). Households in Sumatra showed the highest average level of food intake: 1,700 Calories and 47.5 grams protein of which 13.9 grams (29 percent) was of animal origin. The Bali and West Nusatenggara samples showed an average food intake somewhere between that of Java and Sumatra, viz., 1,693 Calories and 42.8 grams protein (6.5 grams or 15 percent animal protein) (see Figure 12).

By setting the average recommended daily calorie and protein allowances per capita at 1,900 and 40 grams respectively,[2] Sajogyo found that 74 percent of the households were calorie deficient and 51 percent were deficient in both calories and proteins. These figures are in agreement with Sukhatme's data from India (Table 35). From his Indian data Sukhatme showed that the diets were much more limited in calories than in protein. By using the protein-calorie concentration (NDpCals%) approach, he came to a conclusion that protein deficiency is primarily determined by the degree of calorie deficiencies (Sukhatme, 1972). Sajogyo also emphasized the importance of dietary staples, especially the proportions of rice and corn, in achieving adequate levels of calorie and protein intake.

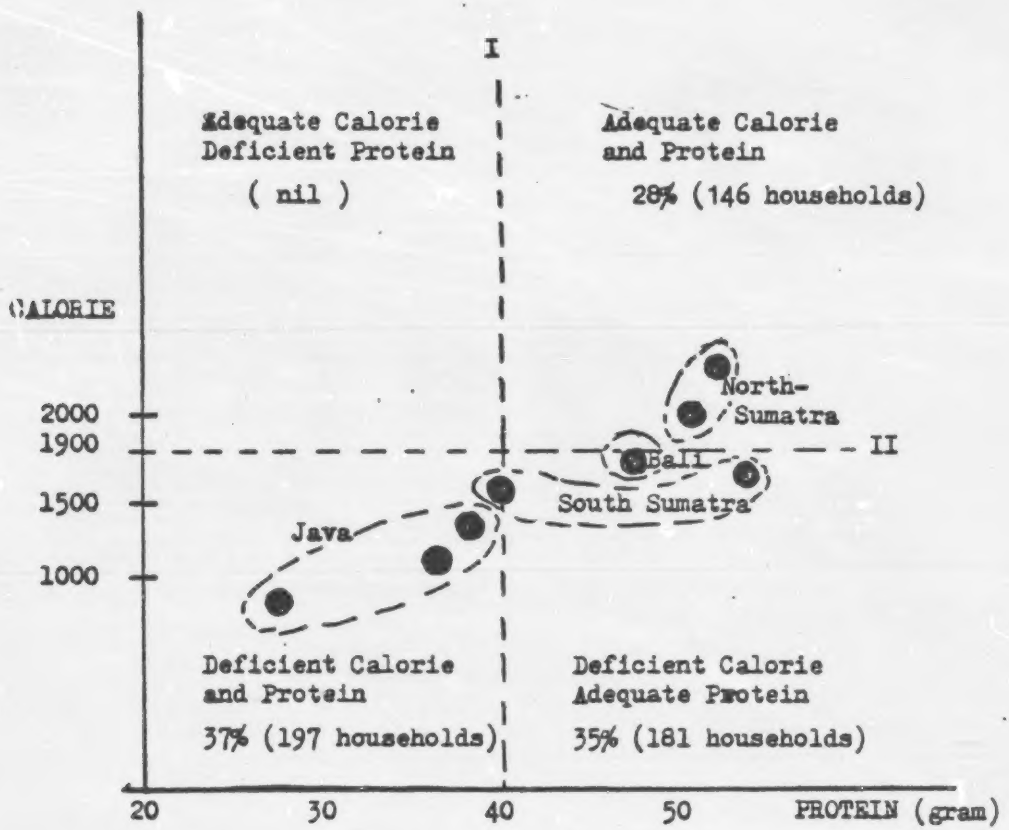
These data suggest that on aggregate, calorie deficiencies are more substantial than protein deficiency, as suggested by Joy in his paper "Food and Nutrition Planning". However, the statement that in Low Income Countries "the problem is generally one of calorie rather than protein deficiency" (Joy, 19—) though in part true should be used with caution in Indonesia. Such a statement could mislead the government into concentrating their policies entirely on cereal production only (e.g., rice policy) thus neglecting the substantial need for increasing production of legumes to balance the quality of protein provided by cereals. It should be stressed that in Indonesia the problems are both calorie and protein deficiencies.

1/ Eight villages in Sumatra, 18 in Java, 4 in Bali and Nusatenggara.

2/ Based on the new FAO/WHO Energy and Protein Requirement, 1972. It is unclear how the figure for protein is computed. The calorie requirement agrees with the figure suggested for developing nations (country 1, p. 82). The protein requirement is probably based on the theoretical safe level intake of the hypothesized country on page 87, viz. 29 grams of reference protein, and then adjusted by country and protein quality, as: 29 x 0.85 (adjustment based on the calorie requirement of country 2 and country 1, page 82) x 1.67 (correction factor for protein quality) = 41.6.

The formal RDA used is based on the Workshop on Food, 1968, viz., 2,300 Calories and 60 grams protein per capita-day at retail level.

Figure 12 . MEAN HOUSEHOLDS CALORIE AND PROTEIN LEVELS PER CAPUT PER DAY IN 16 VILLAGES IN SUMATRA, JAVA AND BALI (n = 524 HOUSEHOLDS)



Vertical line I = recommended protein allowance set at 40 grams per caput per day

Horizontal line II = recommended calorie allowance set at 1900 Calories per caput per day.

SOURCE : Sajogyo, 1974.

Table 35. INCIDENCE OF CALORIE AND PROTEIN MALNUTRITION HOUSEHOLDS, INDONESIA AND INDIA (percent)

Calorie	Protein				Percent Sub-total	
	Indonesia (n = 360)		India (n = 862)		Indonesia	India
	Def.	Adeq.	Def.	Adeq.		
Deficient (Def.)	51	23	23	9	74	32
Adequate (Adeq.)	0	26	5	63	26	68
Total	51	49	28	72	100	100

Source: Indonesia: Sajogyo, 1974, "Ringkasan Hasil Survey Evalugsi Proyek UPGK," ("Summary and Evaluation Survey"), LPSP, IPB, Bogor. Protein adequacy here was set at 40 grams per capita per day, and calorie at 1,900 Calories.

India: P. V. Sukhatme, 1972, "Protein Strategy and Agricultural Development," Indian J. Agr. Econ., 27: 1-24. Data taken from 862 households in Maharashtra.

Another interesting finding of the ANP survey is the fact that in the 30 sample villages the main staple foods were rice and corn, and in only 3 villages in East Java and Gunung Kidul (Central Java) did tubers or root crops (cassava and sweet potato) contribute more than 40 percent of the staples. Table 36 shows the proportion of corn in the rice-corn staples of various sample villages. It is evident that in 23 villages the daily cereal intake (rice and corn) was less than 350 grams per capita.[1] Eight out of those 23 villages, all of them in Java, had an average intake of less than 250 grams. Only 7 sample villages had an average cereal intake of more than 350 grams per capita-day, viz. 4 villages in Sumatra, 2 in Bali and Lombok (West Nusatenggara) and 1 in West Java. The levels of cereal intake correlate significantly with the levels of total calorie and protein intake, as mentioned before.

The role of corn in the diet was significant in Java, particularly in East Java. Corn is also important in densely populated areas regardless of the availability of irrigated land (wet-paddy). The fact that the ANP figures on cereal intake shown in Table 36 are lower than "SUSENAS" data of 1969 was speculated as being due to the impact of a long drought in 1972. The overall picture of the average household food consumption patterns analyzed from the "SUSENAS" data collected in two different seasons in 1969/1970 (Table 37) is more or less comparable to ANP data.

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[1] RDA for cereals (Workshop on Food, 1968): 390 grams rice and corn.

Table 36. LEVELS OF MAIN STAPLE FOOD (RICE AND CORN) AND THE PERCENTAGE OF CORN IN THE STAPLES, (December 1972 - February 1973)

Provinces	n (households)	Cereal Intake						"SUSENAS" data[a]	
		< 250 g.		250 - 350 g.		> 350 g.			
		(1)	(2)	(1)	(2)	(1)	(2)	(3)	(1)
West Nusatenggara	79	-	-	4	1	2	1	-	-
Bali	80	-	-	4	1	2	1	294	3
East Java	145	16 (0-62)[b]	5	81	1	-	-	304	27
Central Java	299	15	2	20 (5-30)[b]	6	-	-	311	26
Jogyakarta	50	37	1	39	1	-	-	190	1
West Java	79	-	-	9	1	11	1	397	2
South Sumatra	159	-	-	1	2	1	2	408	1
North Sumatra	160	-	-	0	2	0	2		

(1) = percentage of corn in the staples (rice + corn)
(2) = number of sample villages.
(3) - total cereal intake (grams).

[a] Data collected in October - December 1969.

[b] Range.

SOURCE: Sajogyo, 1974, op. cit.

Table 37. HOUSEHOLD FOOD CONSUMPTION IN TWO SEASONS, OCTOBER-DECEMBER 1969 AND JANUARY-APRIL 1970, IN INDONESIA

	Indonesia		Java		Indonesia Other Islands		Bali		Sumatra	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
1. Rice	287	288	262	256	350	350	280	304	403	408
2. Corn	60	83	67	103	43	44	14	24	5	5
3. Tubers[a/]	180	126	183	141	177	99	362	270	189	99
4. Pulses[b/]	8.2	8.5	6.7	7.1	12.2	10.8	15.3	16.5	10.8	9.5
5. Fish (fresh)	40	44	30	31	65	75	36	33	66	71
CALORIE	1550	1577	1524	1532	1755	1671	1594	1629	1820	1723
PROTEIN (g.)	36.9	39.5	33.2	36.0	45.9	47.3	34.0	36.5	46.8	47.6

(1) = consumption during October-December 1969.
(2) = consumption during January-April 1970.
a/ Cassava and sweet potato
b/ Peanut and soybean
Source: "SUSENAS", 1969/70, compiled by Sajogyo, 1974, op. cit.

Food Consumption Patterns of the Poor

It has been hypothesized that

> "relatively declining products of corn and tubers in the 'Pelita-I' with stable prices and increasing export of those commodities implied that the position of those crops will shift from a rice substitute to a commercial crop. As rice production increases substantially, more rice will be in their diets. This means a contribution to improved nutrition" (Department of Agriculture, 1972).

The preceding section on production has shown that rice policy benefitted mainly the bigger farmers. Thus it is important to know whether this phenomenon is reflected in the food consumption patterns.

According to Sajogyo's analysis of the extent of poverty in Indonesia, 46 percent, or approximately 50 million people, in Indonesia live "below the poverty line". Most of them live in rural Java. Thus, in Java alone where the average food consumption level is the lowest, more than 40 million people are poor (Table 38).

As described in Table 39, there is a substantial gap in calorie and protein intake between the poor and the better off people. The former consumed 30 to 40 percent less calories and had half the protein intake of the latter. Twenty-four percent of the calorie and 30 percent of the protein intake of the rural poor are derived from corn, while for the rural better off only 13 percent of both calories and protein originated from corn. On the other hand, urban people, even the poor, had to rely mainly on rice. The latter appear to have a food intake level even worse than that of the rural poor.

Table 38. THE NUMBER OF POOR PEOPLE ("BELOW POVERTY LINE"), 1969/70, IN INDONESIA (percent)

	Rural	Urban	Rural and Urban
1. Java	57	54	56
a. West Java			35
b. Central Java			64
c. Yogyakarta			67
d. East Java			60
2. Other Areas (outside Java)	28	38	29
a. North Sumatra			21
b. South Sumatra			10
c. Bali			35
d. West Nusatenggara			47
3. Indonesia	46	49	46

Note: The poverty line is set at the per caput annual income equivalent of 240 kg. rice for rural households and 360 kg. for urban households.
Source: "SUSENAS", 1969/70, compiled by Sajogyo, 1974, op. cit.

If because of rice policy the production and supply of corn declines, if the price differential between rice and corn remains relatively small, and if the negative attitudes towards corn persist, then it is likely that the rural poor may shift their diets towards a greater consumption of rice. However, as observed in the urban poor, a higher rice diet is not a guarantee of improved nutrition for these groups; unless there are endeavors to increase the consumption of other calorie and protein containing foods.

Inter-Family Food Distribution

Quantitative data on inter-family food distribution are rarely available, including Indonesia. The data on food consumption patterns of pregnant women discussed in a previous section (see Anemia, Figure 3) suggest that males have a more adequate food intake than women.

The food habit survey carried out in Indonesia in 1969 (Tan, 1970) indicated that women in Indonesian rural society are a deprived group in respect to the food distribution pattern in the family. There are many food taboos, and other restrictions for women. These relate to beliefs regarding the process of reproduction, child-bearing, and to the health of mother and infant.

In developing countries females and children are often the groups who are most vulnerable to inadequate dietary intakes. In this sense they are "non-privileged" members of the family as well as in the society, as suggested by Vahlquist in Figure 13 (Vahlquist, 1972).

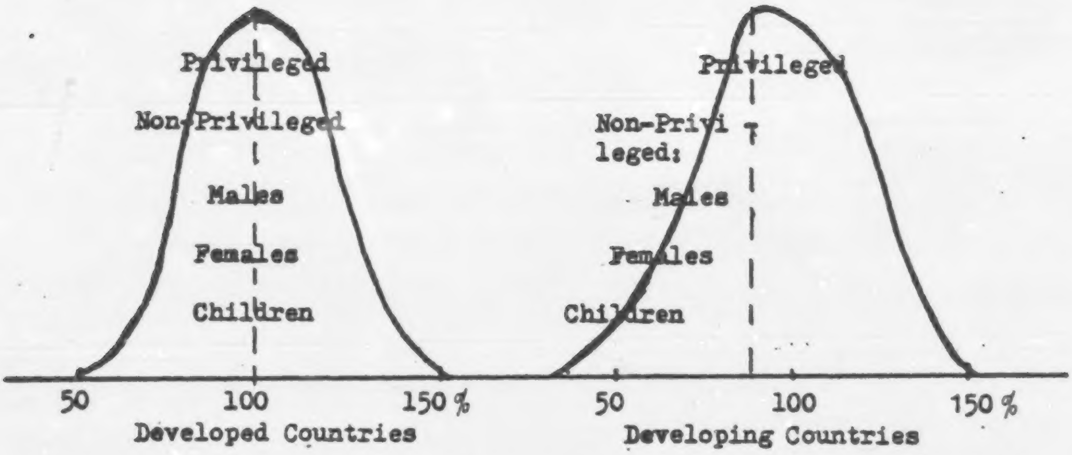
Table 39. THE FOOD INTAKE OF RURAL AND URBAN HOUSEHOLDS IN JAVA, BY INCOME LEVELS, OCTOBER-DECEMBER 1969

	Rural Households (59.3 million)			Urban Households (11.9 million)		
	Poor (52%)	Better Off (48%)	Mean	Poor (54%)	Better Off (46%)	Mean
I. Calories:						
1. Rice + Corn + Tubers	1,143	1,778	1,455	1,009	1,325	1,182
2. Pulses + Coconut	40	66	54	45	77	61
3. Fish + Meat + Eggs	24	84	52	30	121	77
4. Sugar + Oil	76	244	157	107	280	193
Total Calories	1,283	2,172	1,718	1,191	1,820	1,513
— Calories from rice (%)	47	60	55	76	70	71
— Calories from rice and corn (%)	71	73	71	79	71	73
II. Protein (g.)						
1. Rice + Corn + Tubers	21.4	35.3	27.8	20.3	27.3	23.7
2. Pulses + Coconut	0.8	3.4	2.2	1.5	5.1	2.9
3. Fish + Meat + Eggs	4.7	14.9	9.7	5.6	19.1	12.2
Total Protein[a]	26.9	53.6	39.7	27.4	51.5	38.8
— Protein from rice (%)	47	51	49	69	52	58
— Protein from rice and corn (%)	77	64	68	73	53	60
— Vegetable protein (%)	83	72	76	80	63	69
Protein-Calorie Percent	7.9	9.4	8.9	8.7	10.9	10.0

[a] Total calories/Protein the four food categories.

SOURCE: Sajogyo, 1974; calculated from "SUSENAS", Central Bureau of Statistic, Jakarta. The poverty line is set at the per caput annual income equivalent of 240 kg. rice for rural households and 360 kg. for urban households.

Figure 13. NUTRIENT DISTRIBUTION PATTERNS IN DEVELOPED AND DEVELOPING COUNTRIES



SOURCE : Vahlquist, B.,(1972),"Malnutrition as a Socio-Medical Problem", in Vahlquist,B.(ed.),"Nutrition: A Priority in African Development". The Dag Hammarskjold Foundation, Sweden,p.23

The previously described food habit survey in Indonesia showed that children were given the first priority for scarce foods. This is probably true for some commodities such as rice or sometimes meat. However, other "luxury" foods such as milk (usually sweet-condensed milk), eggs and certain kinds of fish, which are occasionally available in the better-off rural diets, are reserved for special guests and respected members of the family (usually father and older members).

The fact that in the ANP survey the incidence of PCM in the pre-school children in Indonesia was found to be high in the households with adequate average as well as inadequate average food intakes (Sajogyo, 1974) confirms the above phenomenon; that is, children do not obtain a proportional share of the food available to the family.

Thus, Indonesia is by no means different from many other developing countries in respect to the role of social, cultural and economic factors affecting the food consumption patterns in the family. This review has shown that maldistribution of available food in Indonesia exists among different economic classes as well as within the family.

DISCUSSION

The discussion in this section will be focused on the policy implications inherent in dealing with the nutrition problems already outlined. First, the problems will be defined based on the previous discussion. Second, suggested priorities will be argued; and third, the implications of the proposed priorities as they relate to government policies will be outlined.

Definition of Problems

A simplified table summarizing the preceding discussion (Table 40) provides the list of possible variables involved in each of the nutrition problems and the severity of the problems in the community. In this table the variables are categorized into three major problems: Food Supply, Ecology, and Population problems. It is realized that these categories are not distinct, but overlap, and they are not all inclusive.

From Table 40 it can be seen that none of the four main nutrition problems in Indonesia could be classified as "not serious". However, because PCM frequently is an underlying cause of vitamin A deficiency and Iron Deficiency Anemia, and because of its prevalence and public health importance, it is clear that PCM is Indonesia's most serious nutritional problem. From an examination of the number of variables involved in each form of malnutrition, it is clear that the nature of PCM, vitamin A deficiency and Iron Deficiency Anemia are complex.

By contrast, the problem of goitre is the least complex and the most easily solved. Although limited by geographical boundaries, goitre is significant in its extent. People tend to underestimate the seriousness of goitre because it affects a relatively "small" number of people. However, for a country like Indonesia where more than 70 million people still live in rural areas, some of which are subject to iodine deficiency, a "small" percentage of the population may, nonetheless, be millions. Goitre is of great public health importance, particularly in pregnant women, where it may lead to mental retardation, deaf mutism or cretinism in their children.

Table 40. THE COMPLEMENTARY NATURE AND EXTENT OF NUTRITION PROBLEMS IN INDONESIA[a/]

Contributing Factors	Nutrition Problem			
	PCM	Vitamin A Deficiency	Nutritional Anemia	Goitre
I. Food Production and Supply:				
— inadequate	+	±	± -	-
— maldistribution	+	+	+	-
II. Ecology:				
— economic	+	±	+	-
— environmental health	+	+	+	-
— socio-cultural	+	+	±	-
— topography	-	-	-	+
III. Population:	+	+	+	-
Population Affected:				
— pre-school child	X	X	$\underline{X}$**	$\underline{X}$*
— school child	$\underline{X}$	0	$\underline{X}$	X
— adult women	$\underline{X}$	0	X	X
— adult men	$\underline{X}$	0	X	X.
Prevalance (percent):	mod. 22-44 sev. 2-5	±8(2-23)	women: 40-85 men: 30-40 child: **	boys: 30-85 girls: 40-90 women: 80 men: 60

[a/] + = significant contributor
± = not necessarily important contributor
- = insignificant contributor
X = commonly affected
$\underline{X}$ = may be affected but uncommon or difficult to specify
0 = not affected.
* = affected as foetus of iodine deficient pregnant women
** = mostly embodied in PCM.

It should be evident from the previous discussion that in general, nutrition problems in Indonesia are problems of inadequate food production and supply, especially in Java. Food maldistribution and food habits in the community and in the family aggravate the existing food shortage. There is a great variation in the food and nutrition situation in various regions in Indonesia. Joy, in his previously quoted paper, also stated that in Low Income Countries, the nutrition problem is more the problem of ineffective demand rather than ineffective supply. In Indonesia the problem is both, and the ineffective demand is not merely due to poverty.

The population problem as one of the contributing factors to nutrition problems in Indonesia will not be discussed, since many publications have been devoted to this subject. In addition, population control has already been given a high priority in Indonesia's development plan.

Setting Out Priorities

The criteria for setting out priorities applied here are based on Bryant's concept of the decision-making process as cited by David Morley (Morley, 1973). Bryant suggests that after defining the problem in a problem-solving process, the next step is to set out priorities taking into consideration the following points:

(i) Community Concern; priority should be community oriented.
For this discussion we define "community concern" as a reciprocal process between the right of people to obtain the highest degree of health status and the government obligation to provide the means to achieve that right as one of the objectives of development. The latter is presumably more effective where methods of inducing active participation of the people are employed.

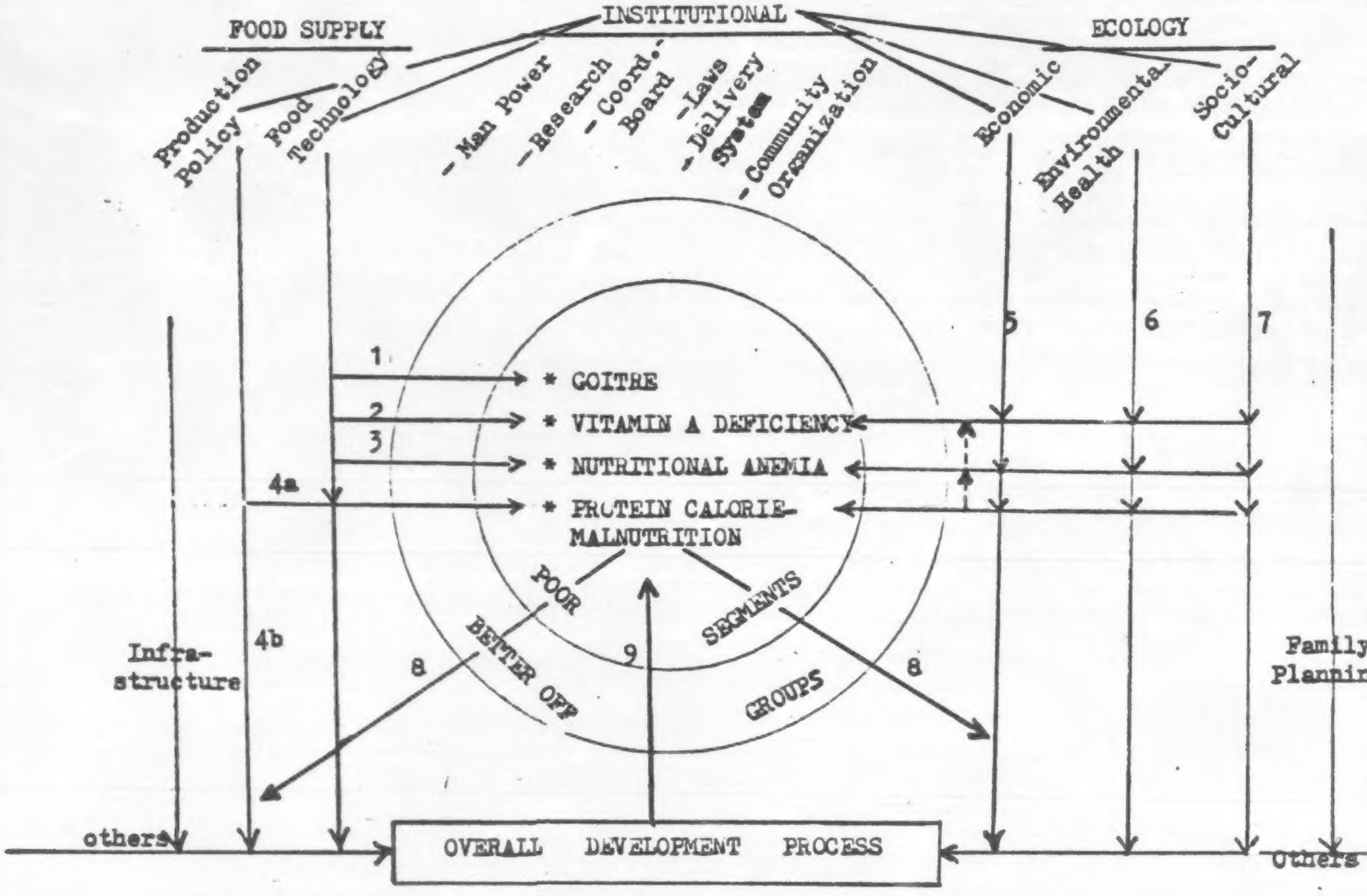
The reciprocal process of "community concern" is illustrated in a conceptual model of the development process linked with food and nutrition policy (Figure 14). It has been postulated that malnutrition hinders production and economic growth (arrow 8) through mortality, morbidity, absenteeism and low productivity (Berg, 1973b).1/ In turn, a development strategy including food and nutrition policy attempts to release the malnutrition constraint to enhance the development process (arrow 9). Thus, by definition all nutrition problems in Indonesia fall under the heading of "community concern" and hence deserve priority.

(ii) The prevalence in the community rather than in hospitals, and the seriousness of the problem in terms of its public health significance.
As already delineated, all four nutrition problems in Indonesia are prevalent in the community and should be regarded as serious.

(iii) Vulnerability to Management.
A problem might be serious and prevalent and of a "community concern" type but may be so complex that a solution is very difficult to plan. In this case only a well planned multi-sectoral coordinated program is likely to be able to deal with the problem. This kind of program requires careful planning and skill if it is to be successful.

1/ The conceptual mechanism of this process is described, a.o., by Call and Levinson (Call, 1973) and also by Popkin (Popkin, 1972) (see Appendix 4).

Figure 14. THE COMPLEMENTARY MEASURES IN DEALING WITH NUTRITION PROBLEMS IN INDONESIA : DEVELOPMENT PROCESS WITH A FOOD AND NUTRITION POLICY


INSTITUTIONAL
FOOD SUPPLY
ECOLOGY
Production Policy
Food Technology
- Man Power
- Research
- Coord.- Board
- Laws
- Delivery System
- Community Organization
Economic
Environmental Health
Socio-Cultural
1
2
3
4a
4b
5
6
7
8
8
9
* GOITRE
* VITAMIN A DEFICIENCY
* NUTRITIONAL ANEMIA
* PROTEIN CALORIE MALNUTRITION
POOR
SEGMENTS
BETTER OFF
GROUPS
Infra-structure
Family Plannin
others
Others
OVERALL DEVELOPMENT PROCESS

Nutritional deficiency diseases (nutrition problems) hinder production and economic growth through high mortality, morbidity, absenteeism and low physical and intellectual productivity (8). Food and Nutrition Policy,if effectively implemented, tries to release these constraints to generate economic growth and development. An overall development strategy which give a high priority on rural development and the problems of the poor , in combination with a Food and Nutrition Policy, is an - effective approach in alleviating nutrition problems. (9)

1 = Salt-iodization, technology available, institutional problems minimum.
2 = Vit.A massive dose program; more institutional problem than technology. Vit.A fortification, needs more research.
3 = Fe-fortification, needs more research. Other complementary measures are prerequisite.
4a= Priority on rice, corn, sorghum and legumes production,a.o.for suplementation program.
4b= More food for wages-goods, cash crops for export, etc. to generate economic growth.
5 = Employment, subsidy, price policy,etc. to facilitate better income redistribution.
6 = Water supply, sewage and suwerage system, personal hygiene, vaccination etc.
7 = Health and nutrition education.

All four nutrition problems fall within these criteria, except for goitre. The "unsuccessful" reports of programs to combat malnutrition (usually PCM) in many countries, including Applied Nutrition Programs (ANP) (Berg, 1973b), Nutrition Rehabilitation Centres (Darisme, 1972) and Food Supplementation Programs in Indonesia (Prawiranegara, 1972 are believed to be primarily as a result of the difficulties in applying the so-called "coordinated" or "concerted" approach. Crash programs or sectoral programs in dealing with PCM are unlikely to be fully successful.

The conquest of vitamin A deficiency has been admitted by Oomen to have been an unsuccessful and half-hearted effort in the past (Oomen, 1974). For example, the initial success of Red Palm Oil program for alleviation of xerophthalmia in Indonesia was not successfully followed up, probably because of certain cultural factors (unattractive taste and color) and management problems (procurement, storage, delivery system, personnel, etc.).

The prospect of preventing xerophthalmia seems brighter with the vitamin A massive dose programs which are now underway in India, Bangladesh and elsewhere. An interim report on the implementation of this program in Indonesia however, suggests that the burden on managerial resources is great (Tarwotjo, personal communication). Such a program does not eliminate the underlying causes of xerophthalmia. A long term complementary program is still therefore needed to eradicate xerophthalmia completely.

Programs to alleviate iron deficiency anemia are even more fraught with managerial problems and the results may be very discouraging. The positive result of the experiment on iron supplementation conducted in Indonesia and those performed elsewhere are not suitable for application in a normal society. Very high managerial talent and skill are required to undertake such programs. The possibility of combating anemia and goitre using iron and iodine fortification of salt was proposed by MIT-WHO team to Indonesia (M.I.T., 1974) and by Basta (Basta, 1974). Nevertheless ecological factors, including environmental sanitation and the economic situation, are likely to be significant obstacles which need to be overcome. But of these problems goitre is the one which could most easily be eradicated in a relatively short period of time. Goitre is a disease that can be controlled without social or economic change in the society.

As stated by Aykroyd, the future of goitre depends on the action taken by governments and public health departments to introduce salt iodization for its control and the expansion of these programs to benefit larger numbers of people (Aykroyd, 1970). Although in Indonesia the logistics and distribution may be difficult as suggested by Van Veen (Van Veen, 1950)[1/] and by the MIT-WHO team (M.I.T., 1974), the burden on management is minimal.

Without belittling the importance of the other program proposals made by the MIT-WHO team to the government of Indonesia in 1974, nevertheless it should be stressed that a program of salt-iodization is currently the most readily applicable and "quick-yielding" program that the government could

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[1/] and personal communication.

immediately adopt. Evidence suggests that it would be feasible to significantly reduce goitre within a "Pelita" (5 years) period (WHO, 1960, p. 385; Scrimshaw, 1970) and that a "nutrition success story" would be a stimulus and incentive to move ahead with more extensive and difficult programs to deal with PCM, xerophthalmia and anemia.[1]

Policy Implications

From the preceding discussion on priority, it can be concluded that in the initial stages of development (at least in "Pelita-II") when resources are limited, the target of a nutrition program should be directed to: (i) problems least vulnerable to inadequate management, (ii) problems with high probability of success, and (iii) problems which are significant in prevalence and public health importance.

At the present state of knowledge, problems which fulfill these criteria are: (a) goitre, with the salt iodization program, (b) xerophthalmia with the vitamin A massive dose program.

For PCM, and thus anemia and vitamin A deficiency as well, complementary measures are likely to be a conditio sine quanon. The prerequisite for the success of such measures, it is believed, inter alia, depends upon: (1) the presence of an effective food and nutrition policy in the country, and (2) the establishment of an effective Nutrition Coordinating Board at central government level.

Food and Nutrition Policy

Bengoa defines Food and Nutrition Policy as

> "the formulation of a set of co-ordinating measures which, when implemented, will ensure the best possible nutritional status for the whole population but focus particularly upon the protection of those groups in which malnutrition is most prevalent" (Bengoa, 1973b).

Thus, a Food and Nutrition Policy (FNP) is a comprehensive formulation of the extent of nutrition problems and of the guidelines for dealing with the problems. The following are the examples of the breadth that should be built into a FNP:

(i) A FNP should ensure that nutrition programs to alleviate nutrition deficiency diseases are given priority in government activities.

(ii) A FNP should ensure that the increase in food production provided for in "Pelita" meets the nutrition needs of all segments of the population, particularly the low income groups who are vulnerable to nutrition problems.

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[1] The reluctance among policy makers in adopting nutrition as one of the major components in development plans is, inter alia, due to the fact that many "unsuccessful" nutrition programs have been encountered. Hence, once there is an opportunity to develop nutrition programs in context with development, a program with high probability of success should be put forward (Latham, personal communication).

Since food patterns vary by region and economic class, and since the diets of the majority of the people are deficient in calories and protein, the food production target should be concentrated to meet those needs. Implicitly, the food production and supply policy should induce people to have varied staple foods and not encourage them to depend solely on rice.

(iii) A FNP should encourage the government to give a high priority to rural development programs to generate better income redistribution, better education (including health and nutrition education), better health services, agricultural development etc., so that a better nutritional status can be achieved along with the improvement in living conditions.

(iv) A FNP should facilitate the development of nutrition research. Aside from the main objective of searching for methods of solving nutrition problems, certain community research activities (such as food supplementation experiments) could be regarded as an indirect means of income redistribution.

(v) A FNP should advocate the development of nationwide nutrition education programs as an essential and integral part of any program to induce change in attitudes and behavior of the people toward better living conditions.

(vi) A FNP should advocate the participation of private food industries in increasing the nutritional value of their products by adopting the available technology which is applicable to Indonesia (fortification, protein rich foods, etc.) and at once forestall the danger of new technology inducing nutrition problems.[1]

(vii) As institutional constraints are assumed to be the major obstacles to implementing nutrition programs in Indonesia, a FNP should also facilitate the development of nutrition manpower, research institutions, nutrition and health delivery systems, food and nutrition laws, a coordinating body, etc.

National Food and Nutrition Board

The main function of this board is to promote, introduce and monitor the implementation of Food and Nutrition Policy. Bengoa, in the second Asian Nutrition Congress in Manila in 1973 gave the outline of the job description of a Food and Nutrition Board, which should of course be adapted to local conditions (Bengoa, 1973b). The following are examples of the job description modified from Bengoa for the Food and Nutrition Board in Indonesia:

1. To coordinate, at planning and evaluation levels, any nutrition program in the country.
2. To set priorities and to recommend accordingly to higher government agencies for the allocation of resources.
3. To advise on the nutrition implications of various government policies in food production and supply, population, employment, education, etc.
4. To monitor the nutritional status of the population through periodic data collection on food production, supply, consumption, and clinical aspects.
5. To issue a periodical comprehensive report on the nutrition situation of the country for domestic as well as international purposes.

For Indonesia at present (at least in the "Pelita-II"), a special division of the National Planning Board ("BAPPENAS") with the above functions is probably sufficient; providing that the personnel in charge of the job meet the requirement pointed out by Bengoa:

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[1] For instance, the displacement of breast feeding with bottle feeding, etc. (Jelliffe, 1971; Popkin, 1973).

> "having a broad knowledge and understanding of the complexity of food and nutrition problems as well as the need for a multi-sectoral co-ordinated approach in dealing with them."

The establishment of the board at ministerial level depends on the effectiveness of a "nutrition division" which is attached to "BAPPENAS". If progress is significant, if a "success story" can be presented to the government, and if there is evidence that a larger program is needed, then the establishment of a National Food and Nutrition Board with a defined policy and with greater power should follow.

In conclusion, the policy implications in dealing with nutrition problems in Indonesia can be classified as:

(1) A policy to facilitate the alleviation of goitre and xerophthalmia.
(2) A policy to facilitate more comprehensive measures in dealing with PCM, nutritional anemia and also vitamin A deficiency, by establishing a Food and Nutrition Policy, and a coordinating institution.

SUMMARY AND CONCLUSIONS

In contrast to the First Five-Year Development Plan ("Pelita-I"), in the "Pelita-II", 1974/75-1978/79, food and nutrition problems are explicitly delineated in its context of the overall development in Indonesia. It implies that there is a growing interest among the policy makers concerning nutrition problems in Indonesia as is the case in several other developing countries.

In dealing with nutrition problems, as with other problems, one first has to understand the extent and nature of the problems. Second, one must set out priorities based on certain criteria, and third, develop program plans. This is followed by the implementation of the programs, their evaluation and their re-planning. This monograph deals with the first and second steps by means of a study of the literature dealing with the past and present food and nutrition situation in Indonesia.

The first parts of this monograph described the nutrition problems and activities in the pre-independence period of 1888-1945. It is evident that the current nutrition activities in Indonesia originate from the eighteenth century when Eijkman found the clue of the relation between beri-beri and polished rice. The nutrition activities at that period were carried out by the Netherland's Indian Institute of Nutrition Research, under the Public Health Service. More than 300 research papers on nutrition were published. The significant achievements of this institute were in laboratory research and dietary surveys.

In the period 1937-1942 there had been 9 extensive dietary surveys, 7 in Java, 1 in Lampung, South Sumatra and 1 in West Ceram, East Indonesia. Total calorie and protein supply per caput per day in the 1930's was about 2,000 calories and 43 grams protein, mainly vegetable protein, however, the situation varied from one region to another. In a prosperous area in West

Java, for example, the average daily calorie and protein consumption per caput was more than 2,000 calories and 50 grams protein; whereas in the poor area of Gunung Kidul this was less than 1,400 calories and 18 grams of protein per caput per day.

The nutrition problems encountered during that period are typical of the present situation, namely Protein Calorie Malnutrition, Vitamin A Deficiency, and Goitre. Very little was mentioned concerning nutritional anemia, probably because the standard methodologies in defining various types of anemia were not available at that time. However, it is believed that nutritional anemia was as prevalent as other nutrition deficiency diseases.

The old nutrition studies in Indonesia demonstrated that the nature of nutrition problems, except goitre, is complex. Many factors such as economic, population, socio-cultural, environmental and others, etc. are involved in the etiology and affect the prevalence of nutrition problems.

Apart from political reasons, the great difficulty in dealing with nutrition problems in Indonesia was probably an important reason for the colonial government's decision to concentrate its nutrition activities mainly in the area of research. One of the few significant nutrition programs introduced in the pre-independence period was salt-iodization, to alleviate goitre in the goitrous areas. This program was initiated in 1927.[1]

Although Indonesian independence was proclaimed in 1945, the continuing physical revolution against the Dutch delayed significant Indonesian government activities in the field of nutrition. It was not until 1950 that public health and nutrition activities could be properly started. By that time, the old Nutrition Institute ("Het Instituut voor Volksvoeding") had been integrated into the Indonesian Ministry of Health to become the Indonesian Institute of Nutrition ("Lembaga Makanan Rakyat").

In the early days of independence, the health conditions in Indonesia were among the worst in the world. The infant and maternal death rates were higher than in many other countries, viz. 115-300 and 2-16 per thousand, respectively. More than 60 percent of the total deaths were attributed to the high mortality rates in children under five years of age. There was only one medical doctor for every 60,000 people, and only 8 hospital beds available for every 10,000 people (Table 1).

When the Indonesian Institute of Nutrition was due to start operation, there were practically no skilled personnel to carry out the programs. Therefore, a training program was initiated immediately, simultaneously with research and nutrition surveys. Although at the beginning of 1950 there were no professional nutritionists in Indonesia, there are now more than 800 with various levels of training (Table 2). About 70 percent of them are still active by working as dietitians in hospitals or as public health nutritionists in the public health departments throughout the country. Nutrition education is always among the first activities to undertake as part of a comprehensive and well developed nutrition program. It is presumed that the current "nutrition boom" in Indonesia would not have emerged had there been no nutrition education activities in the past.

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[1] Ironically, the program was discontinued in 1957 because salt production by private individuals is now permitted.

With the aid of various United Nations Agencies, notably WHO, FAO and UNICEF, and with their consultants and material assistance, nutrition research and applied programs have been instituted in Indonesia. Since the mid 1960's most of the principal nutrition investigators have been Indonesian nutritionists. The major part of this monograph is a review of a part of their work.

Substantial progress has been achieved since independence, particularly with regard to a reduction in the infant mortality rate. Using the infant and child death rates as indicators of the health status of the people, they reflect the accomplishment of public health activities. The infant mortality rate has been estimated to have dropped from more than 250 per thousand in the 1950's to less than 150 in 1973. However, the pre-school child (1-4 years old) death rate has remained as high as ever. More than 50 percent of the total deaths in 1973 occurred in young children of pre-school age. In the early 1950's this figure was slightly higher, viz. approximately 60 percent.

This phenomenon is by no means unique to Indonesia. A similar trend is seen in many developing countries. And it has been agreed that wherever the pre-school child mortality rate is high,[1/] a poor nutritional status is the main underlying cause. The recent nutrition surveys in Indonesia undoubtedly confirm this statement.

The third part of this monograph deals with the nature and extent of the present nutrition problems in Indonesia. It discusses the prevalence, epidemiology and public health implications of the four nutrition problems dealt with in this study, namely, PCM, vitamin A deficiency, nutritional anemia and goitre.

The population most afflicted were pre-school children. This group not only suffered from PCM (22-44 percent), but also from vitamin A deficiency as well (2-23 percent), and nutritional anemia which is commonly found associated with PCM. In mountainous areas these children were also endangered by the fact that 80 percent of women in these areas have goitre. Thus, the occurrence of cretinism and deaf-mutism due to iodine deficiency among these children is probably significant.

The second group in which nutritional deficiency diseases are prevalent is women. In rural areas 40 to 85 percent of them showed signs of nutritional anemia, particularly pregnant women. As mentioned above, in certain areas this group is susceptible also to goitre. From the cultural point of view women in rural areas seem to be a nutritionally disadvantaged and vulnerable group; the food intake, quantitatively and qualitatively, is the lowest in the family.

[1/] Gordon stated that if toddler mortality rate is 10 to 40 percent of infant mortality rate, a poor nutrition status is indicated (Gordon, 1967).

Among adult males, nutritional anemias were also prevalent (30-40 percent), particularly among the low income workers, especially plantation and construction workers. In certain areas, the adult males were also afflicted by goitre.

The fourth part of this monograph discusses food production and supply. It demonstrates that food supply in Indonesia has remained a serious problem. First, the food production on aggregate has not kept up with the rate of population growth; second, there has been the problem of an accelerating demand for rice; and third, the availability of food in Indonesia on aggregate does not meet the recommended dietary allowance for the average Indonesian. In this context it should be kept in mind that there is great variation concerning the food situation in different regions in Indonesia. Generalizations are therefore difficult.

In this section, the disadvantages of the rice policy in terms of nutrition are also discussed. A heavy allocation of resources designed to promote rice production is shown to result in a neglect of the importance of other commodities, particularly corn and legumes. If in the "Pelita-I" the rice production increased by 2 percent above the rate of population growth annually, the production of other basic food commodities was left behind. Despite the considerable increase in rice production, rice imports have been accelerating even faster. Aside from other factors such as increasing income and the high preference for rice--which is reflected in the high income elasticity of demand for rice--the rice policy is presumed to have unconsciously reinforced the increasing demand for rice and to have strengthened the already established negative attitude toward domestic rice substitutes, such as corn, cassava and sago, which traditionally provide a substantial proportion of the calories and protein in the diet of rural people in Java, particularly the poor. There is even a tendency to shift to a higher consumption of rice in the sago-diet areas such as Maluku in East Indonesia, where there have been no nutrition problems recorded so far.

More important is that the rice policy evidently benefitted mainly the bigger farmers who were already well off. This phenomenon is reflected in their food consumption patterns which were delineated in the fifth section. The limited data[1] available for this study showed that the overall average calorie and protein intake in 1973 was 1,528 calories and 42.8 grams protein (8.3 grams animal origin) per caput per day. The lowest average consumption level was found in Java (1,404 calories and 37.8 grams protein) and the highest was in Sumatra (1,700 calories and 47.5 grams per caput per day). Again, there is substantial variation in the food consumption patterns among the regions of Indonesia. Thus, generalization in this respect can be deceptive.

There is a substantial gap between the calorie and protein intake of the poor and the better off people. The former consumed 30 to 40 percent less calories and had half the protein intake of the latter. Twenty-four percent of the calorie and 30 percent of the protein intake of the rural poor are derived from corn, compared with only 13 percent of both calorie and protein intake of the better off people. On the other hand, urban people, even the poor, have to rely mainly on rice. The latter appeared to have a food intake that was even worse than that of rural poor.

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[1] From rural households surveys in 8 provinces of Indonesia (Sajogyo, 1974).

With respect to the average recommended daily calorie and protein allowances per caput, the above data indicated that among the 1,053 households in 30 villages of 8 provinces in Indonesia, 74 percent were calorie deficient and 51 percent were deficient in both calories and protein. It implies that on aggregate calorie deficiency is more substantial and widespread than protein deficiency. However, for Indonesia, the present author argues that the problems (both calorie and protein deficiencies) should both be stressed for several reasons.

Although the poor have been proved, in the above study and others, to have the lowest level of calorie and protein intake, it is imperative to note that PCM and vitamin A deficiency among pre-school children were found not only in this group but in the better off as well. Various earlier studies indicated a similar phenomenon. Thus, there is evidence that maldistribution of available food in Indonesia exists among different economic classes as well as within the family. The role of social, cultural and economic factors in affecting food consumption patterns in Indonesia is substantial.

The last section focuses discussion on policy implications to be considered when dealing with nutrition problems in Indonesia. Having reviewed the extent and nature of the nutrition problems, the author stresses the importance of setting priorities. Three criteria are suggested for determining the priorities: (i) "Community concern" for the problems, (ii) the extent and seriousness of problems in the community in terms of their public health significance, (iii) vulnerability to poor management. It is concluded that in the initial stage of development (at least in the "Pelita-II") the priority in dealing with the nutrition problems in Indonesia should be to alleviate the problem of goitre with a salt-iodization program, and xerophthalmia with vitamin A massive dose program.

In the case of PCM, and thus nutritional anemia and vitamin A deficiency as well, complementary measures are likely to be a conditio sine qua non for their solution. By using a conceptual model, the author has tried to delineate the interaction of various components in combating nutrition problems in general and in relation to the overall development process. For the success of such delicate complementary measures, it is argued that the formulation of a National Food and Nutrition Policy and the establishment of a coordinating body attached to the National Development Planning Board ("BAPPENAS") are prerequisites. The definition and scope of the functions of these prerequisites were depicted in this section.

The implementation of salt-iodization and vitamin A massive dose programs does not necessarily require the realization of the prerequisites for the complementary measures mentioned above. However, if the latter materialize, the former are automatically included.

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Appendix 1: REPORTS ON HUNGER OEDEMA IN CENTRAL JAVA DURING THE PERIOD 1930-1940

Year and Locality (regency)	Number of oedema patients	Causes and other explanations
1930		
Brebes, Tegal, Pemalang, Pekalongan, Batang, Banjumas, Tjilatjap, and Kedu residency		Prolonged drought, floods, (In Banjumas and Tjilatjap 2/3 of harvest damaged)
1931		
Pekalongan (Petungkriono district)		death rate registered 218% in one subdistrict. Death rate in the entire district was 80%
1932		
Pekalongan (in the south, in Kasimpar district), Tegal, Pemalang .	mostly children	economic depression and poverty (daily wages only 3 - 4 cents, those of sugar industry workers only 10-15 cents without food). Malaria
1933		
Tegal, Pemalang		repeated attack of oedema
1934		
Tegal, Pemalang		repeated attack of oedema
1938		
Pemalang (in the south, Watukumpul, Belik and Pulosari subdistricts)	453 people	repeated attack of oedema
Pati (Wedari Djaksa subdistrict)		malaria
Tjilatjap (along the south coast in Kroja, Sumpiuh and Tjilatjap subdistrict)		malaria
Semarang, Rembang, Brebes		malaria

Year and Locality (regency)	Number of oedema patients	Causes and other explanations
1939		
Pemalang (southern part: Watukumpul, Belik, Pulosari subdistricts)	7,744 people, 2,156 died (28%) of whom 332 in hospital	repeated attack of oedema
Purbolinggo (norhtern part: Bobotsari, Mrebet, Karanganjar subdistricts)	268 people 24 died (8%)	
Grobogan, Brebes, Pati Kebumen, Tjilatjap (Maos, Kroja, Sumpiuh and Tjilatjap sub-districts), Pekalongan		malaria, floods, (the population of Tjilatjap fed on waste of gaplek) An epidemic of shigellosis shigae broke out in Pekalongan regency
1940		
Pemalang	22,993 people suffering from malnutrition; of whom 8,475 (37%) suffering from hunger oedema died: 559 (7%) of patients with oedema	
Purbolinggo	8,153 people died: 254 (3%)	
Local outbreaks occurred in Central Java, for example in Tjilatjap (Kroja sub-district), in Pati (Wedari Djaksa, Batang and Dukusseti sub-districts). Banjumas (Djatilawang sub-district) Brebes (Bulakomba sub-district) Grobogan (Pulokulon sub-district) Semarang municipality		

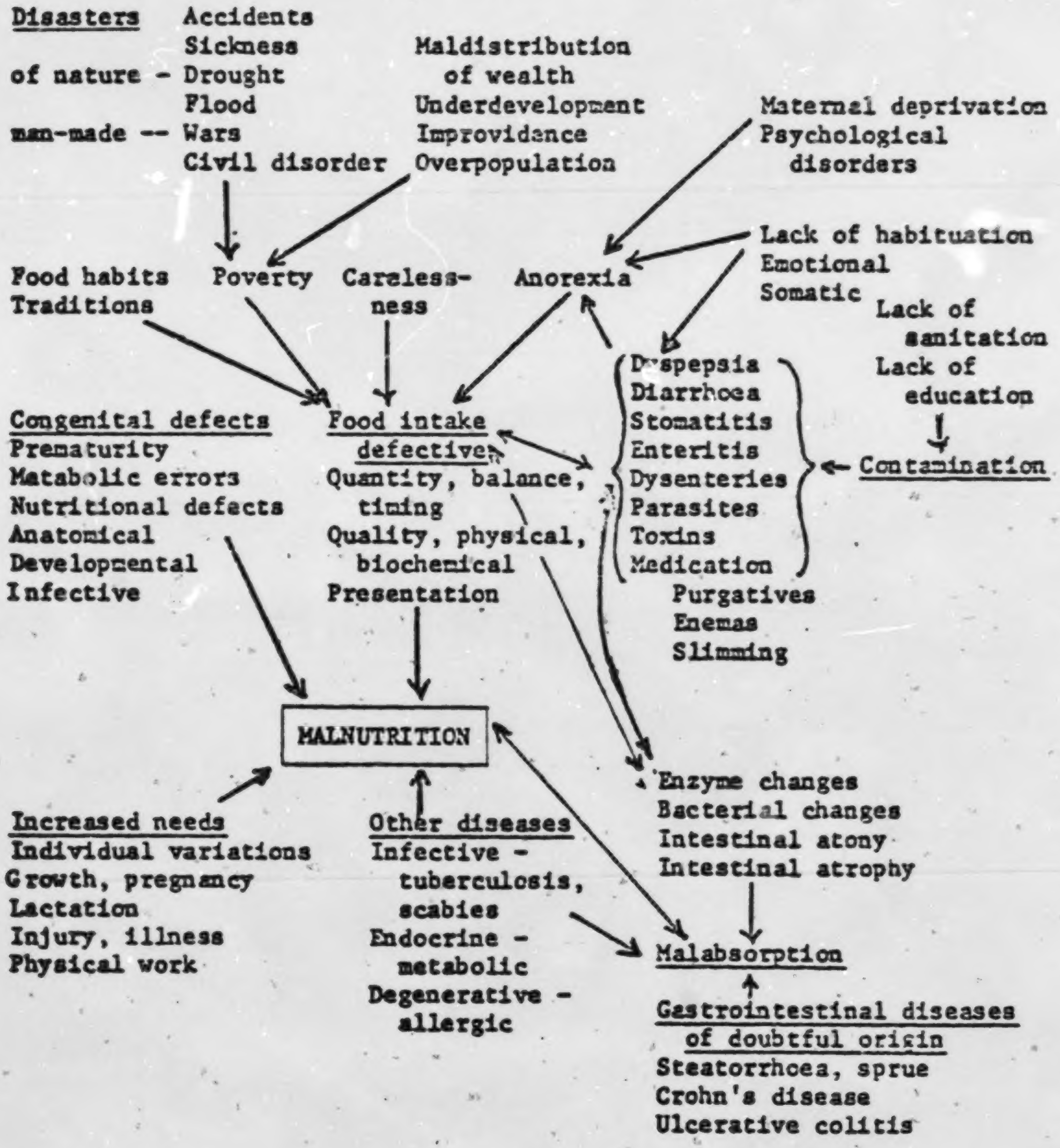
source: Annual Reports of the Medical Officer of health 1930, 1931, 1932, 1933, 1934, 1938, 1939 and 1940
Compiled by Sudirdjo, 1968, p. 146

Appendix 2: NUMBER OF HUNGER OEDEMA PATIENTS IN CENTRAL JAVA BY REGENCY IN 1961 UP TO 1962

Regency	Number of Patients		
	Preliminary oedema	Oedema	Deceased
1. Pemalang	136,451	590	37
2. Kebumen	91,872	44	-
3. Brebes	80,620	2,000	77
4. Banjumas	41,152	163	11
5. Tjilatjap	25,490	308	-
6. Tegal	24,880	23	9
7. Purworedjo	22,313	281	-
8. Purbolinggo	12,028	22	1
9. Pekalongan	7,465	324	21
10. Pekalongan Municipality	5,206	3	-
11. Bandjarnegara	4,358	61	2
12. Semarang	3,700	7	-
13. Temanggung	2,878	55	-
14. Wonosobo	2,636	62	-
15. Sarakarta Municipality	2,338	1	-
16. Pati	744	-	-
17. Bojolali	448	169	-
18. Magelang	391	19	-
19. Sragen	169	114	-
20. Grobogan	141	4	-
21. Sukohardjo	96	-	-
22. Klaten	2	-	-
23. Demak	-	96	-
24. Kendal	-	52	-
25. Karanganjar	-	29	-
26. Kudus	-	-	-
Total	465,378	4,427	158

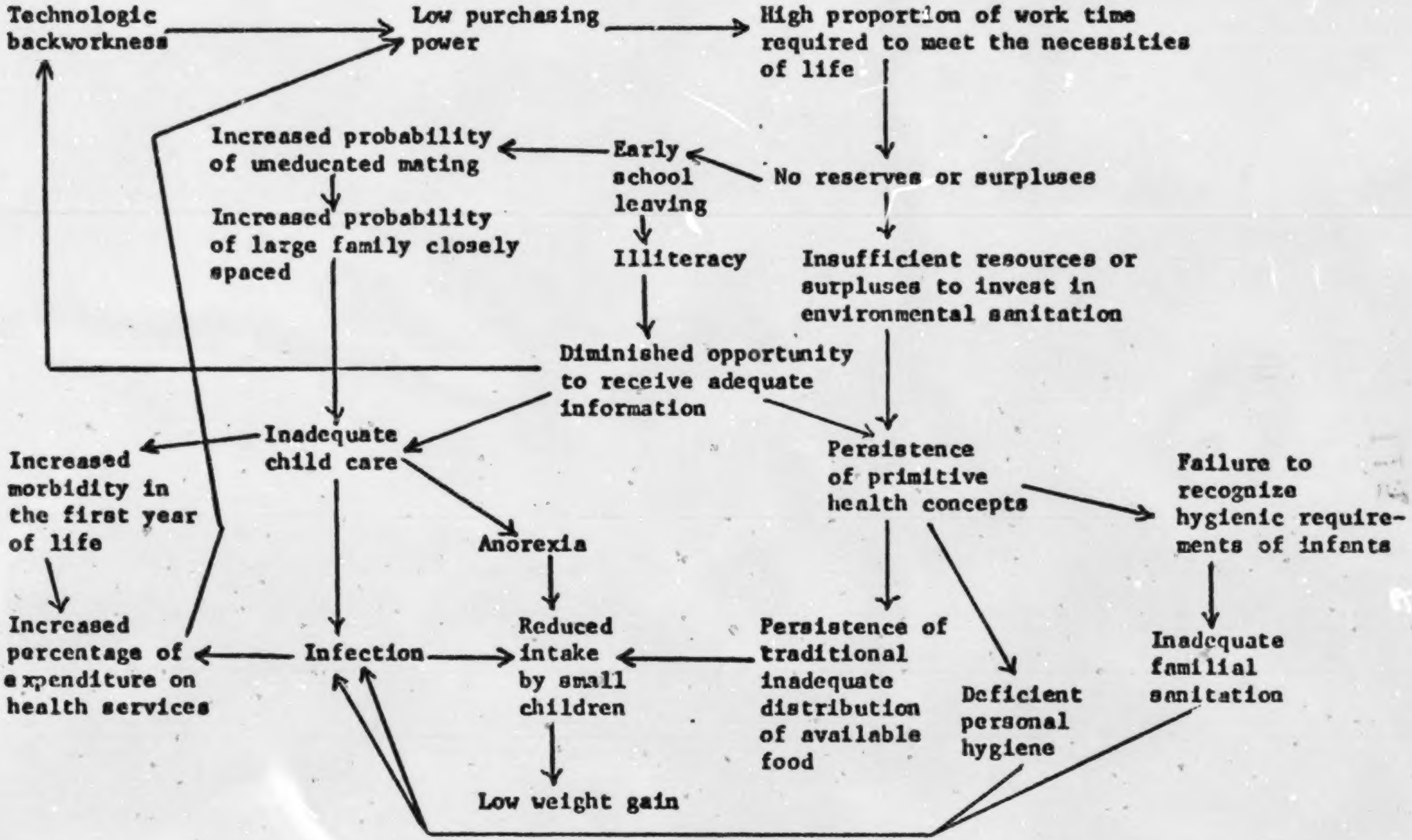
source: Ministry of Social Welfare, 1962
Compiled by: Sudirdjo, 1968, p. 148

Appendix 3a. SOME CAUSES OF MALNUTRITION


Disasters
of nature - Accidents
Sickness
Drought
Flood
man-made -- Wars
Civil disorder
Maldistribution of wealth
Underdevelopment
Improvidence
Overpopulation
Maternal deprivation
Psychological disorders
Lack of habituation
Emotional
Somatic
Food habits
Traditions
Poverty
Carelessness
Anorexia
Lack of sanitation
Lack of education
Dyspepsia
Diarrhoea
Stomatitis
Enteritis
Dysenteries
Parasites
Toxins
Medication
Purgatives
Enemas
Slimming
Contamination
Congenital defects
Prematurity
Metabolic errors
Nutritional defects
Anatomical
Developmental
Infective
Food intake defective
Quantity, balance, timing
Quality, physical, biochemical
Presentation
MALNUTRITION
Enzyme changes
Bacterial changes
Intestinal atony
Intestinal atrophy
Increased needs
Individual variations
Growth, pregnancy
Lactation
Injury, illness
Physical work
Other diseases
Infective - tuberculosis, scabies
Endocrine - metabolic
Degenerative - allergic
Malabsorption
Gastrointestinal diseases of doubtful origin
Steatorrhoea, sprue
Crohn's disease
Ulcerative colitis

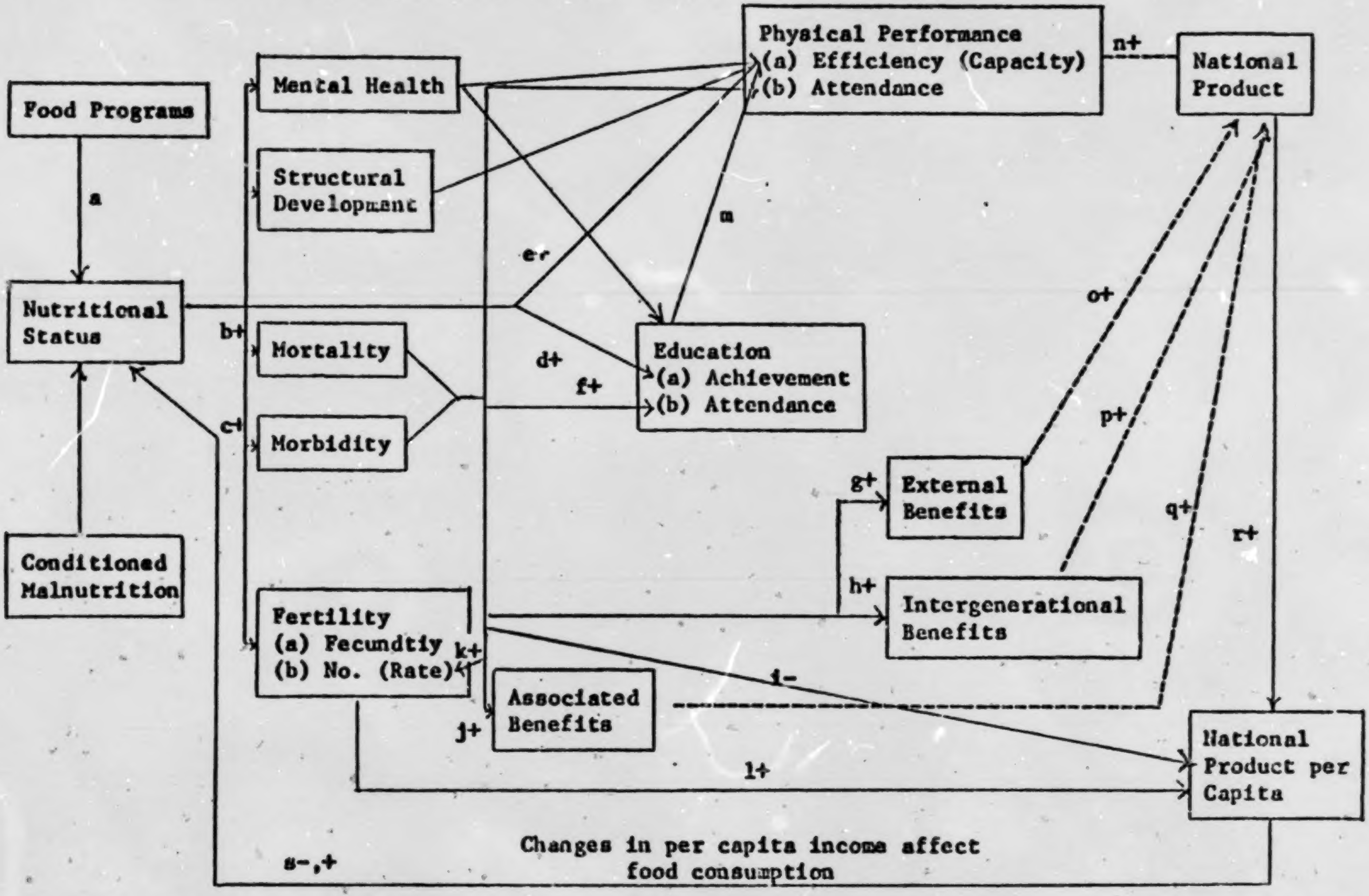
SOURCE: Williams, 1962.

Appendix 3b. INTERRELATION AMONG BIOSOCIAL FACTORS AND LOW WEIGHT GAIN


Technologic backworkness
Low purchasing power
High proportion of work time required to meet the necessities of life
Increased probability of uneducated mating
Early school leaving
No reserves or surpluses
Increased probability of large family closely spaced
Illiteracy
Insufficient resources or surpluses to invest in environmental sanitation
Diminished opportunity to receive adequate information
Inadequate child care
Increased morbidity in the first year of life
Persistence of primitive health concepts
Failure to recognize hygienic requirements of infants
Anorexia
Increased percentage of expenditure on health services
Infection
Reduced intake by small children
Persistence of traditional inadequate distribution of available food
Deficient personal hygiene
Inadequate familial sanitation
Low weight gain

SOURCE: Cravioto, 1973.

Appendix 4. NUTRITION PROGRAMS AND ECONOMIC DEVELOPMENT


Food Programs
a
Nutritional Status
Conditioned Malnutrition
Mental Health
Structural Development
b+
Mortality
c+
Morbidity
Fertility
(a) Fecundtiy
(b) No. (Rate)
k+
j+
Associated Benefits
e+
d+
f+
m
Physical Performance
(a) Efficiency (Capacity)
(b) Attendance
n+
National Product
Education
(a) Achievement
(b) Attendance
o+
p+
q+
r+
g+
External Benefits
h+
Intergenerational Benefits
i-
l+
National Product per Capita
s-,+
Changes in per capita income affect food consumption

Direction of Effects: Major Program Effects ——→ ; Other possible effects from nutritional effects - - - - - → ; Beneficial (-); Detrimental (+).

SOURCE: Popkin, 1972.